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"So perfectly do these little earnest workmen accomplish
their purifying task."

See page 23 of "The Worth of Fresh Air."

HEALTH
FOR
THE HOUSEHOLD:

BASED ON A KNOWLEDGE OF

AIR, WATER, FOOD, CLOTHING, DRINK,

AND

THE TRAINING OF THE MIND.

Twenty-eighth Thousand.

LONDON: JARROLD AND SONS,
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THE WORTH
OF
FRESH AIR.



THE WORTH OF FRESH AIR.



YOUR neighbour, John Stedman, is set fast with aches and pains, and is very ill. You have just been to see him, you say, and you cannot think why it is that people are every now and then attacked in this way with sickness. You have been told that God sends disease; but for your own part you cannot understand then why it is that some of your neighbours, who, like John Stedman, seem to be the most honest and deserving, get the largest share of it. I think, my industrious friend, I can perhaps help you to the explanation of the riddle. At any rate there are many things, touching upon this very subject, which as an old acquaintance, and one who has learned through long intimacy to take great interest in all that concerns you, I have for some time desired to say. I shall now seize this opportunity to make a beginning, and shall sit myself down comfortably that I may chat with you more at my ease. Pray do not trouble yourself to move any thing. This empty chair near the door will do excellently well for me. I know you will listen to me with attention and patience, first for old friend-

ship's sake, and then because you will very soon feel that what I do say is intended frankly and solely for your good.

You have a fine, smart-looking clock, I see, ticking away there opposite. But the old fellow can hardly be so correct as he seems; his hands point to eight, although the day wants but a couple of hours of noon. I fear there must be something wrong about him, notwithstanding his looking so vastly well in the face.

You say you cannot make the clock keep time. You wind it up carefully every Saturday, and set it correctly, and yet before the next Saturday comes round, it has either lagged hours behind, or it has galloped on hours too fast. It goes as if it were moved by the uncertain wind, instead of being driven by regular machinery, and it was a shame for the man to sell you such a bad-going thing. If the clock never did behave itself better, you are right in this: but perhaps you are too hasty in finding fault with the maker; he may not altogether deserve the blame. Let us just open the door of the case, and peep at the inner workmanship, to see whether we cannot discover some cause for the irregular performance.

What is this? As soon as I open this little door I stumble upon something that looks rather suspicious; it is a quantity of light flue, and hair, and dust, mingled together. The clock-maker never put that into the case. Then, observe how every wheel and pinion is soiled with dirt, and every crevice and corner is

choked up with filth. It really would be a very wonderful thing if the wheels did move regularly. The secret of the bad working of your clock is, simply, that you have not known how to take care of it, and use it fairly. I dare say it went very well when it was turned out of its maker's hands, but he never meant it to be in the state in which it now is. You must send it back to him, and get him to clean the works and oil the wheels, and then you must try whether you cannot prevent it from getting into such sad disorder again.

Now, your neighbour yonder with his aches and pains and his sickness, are you sure that he is not in very much the same predicament as this clock? If we could look into the works of his body, are you confident that we should not find them choked up and uncared for, instead of being in the condition in which they were intended to be? His aches and pains, are they not the grating and complaining of deranged and clogged machinery? I am quite aware that sick people generally are not sensible of having allowed anything to come near to their bodies which they ought to have kept away. But neither did you know that dirt was getting to the works of your clock, although we discovered it there in such plenty. The dust and dirt which collected there, first flew about in the air, scattered so thinly and lightly that you could not see them. So, too, other things which you cannot see may have been floating in great abundance

round you, some of them being to the living frame what dirt and dust are to clock-work. That there are such invisible things floating around living creatures, and that some of these clog and derange the working of their frames, I think I shall have no difficulty in showing you. I hope I shall also be able to point out to you, that many of them may be discovered, although they cannot be seen, and may be driven away or avoided.

That wonderful object which you call your *body*, is actually a machine like the clock, contrived and put together for a certain service. It has for its works, muscles and bones, and blood-vessels and nerves. These works have been most beautifully fitted and adjusted: indeed they are the workmanship of a skill which cannot fail. The maker of your body is the great and unerring Power, who has also made all the rest of creation. It is God.

God made your body with supple joints and free limbs; with strong muscles and ready nerves. The machine was perfect when it came from His hands. It was then capable of going better than the best clock that was ever constructed by human ingenuity. It was able even to cleanse, and oil, and repair itself, and it was prepared to continue its orderly movements, without suffering the slightest derangement, for sixty or seventy long years. But when God placed this perfected piece of delicate workmanship at your disposal, He, like the clockmaker with his clock,

required that you should at least take care of it, and use it fairly. If, however, you do not do this, then as with the clock, so will it be with your body. If you keep it amid dust and dirt, no other result can come but the clogging of its works, and the derangement of their movements. Out of that dusty old clock-case it is my purpose to draw this very surprising and important lesson in your behoof. WHENEVER MEN GET OUT OF HAPPINESS AND EASE INTO WRETCHEDNESS AND DISEASE, IT IS ALMOST SURE TO BE THEIR OWN FAULT, AND THE CONSEQUENCE OF THEIR OWN DOINGS. Either they perversely and wilfully do something which they know very well they ought not to do, or they do something which they ought not to do, in ignorance, not knowing that it is wrong.

Comfort and ease are to body and mind, what steady and even movements are to clock-work—signs that the machinery is in perfect order. Discomfort and *dis-ease* (*absence of ease*) are to body and mind what fitful and irregular movements are to clock-work;—signs that the machinery is clogged and in disorder. You are always inclined to rebel against discomfort and pain. Never give way to this inclination. Discomfort and pain are friendly monitors, that come to you to perform a kind service. They come to warn you that there is something wrong in and around your own body, which requires to be set right.

You will observe that I have said men *nearly* always have themselves to blame when they get out of health

and into disease. I have said nearly always, because it occasionally does happen that the suffering is not immediately caused by the sufferer's own wrong doing. This, for instance, is the case when a child has a constitutional disease, which has been communicated to it by a parent. It is, however, even in these instances none the less true, that *human blindness or wilfulness* leads to the mischief, and this is really the practical point that I am desirous you should see. These are the cases in which, in accordance with God's law, "the sins of the fathers are visited upon the children." The parents have done wrong, and the offspring have to pay the penalty. The line of obvious duty, however, is in no way altered here. If a man suffers because his parents did what was wrong, this really is an additional reason why he ought never to do that which may cause his own children to suffer, in like manner, with himself.

There is this further proof, that even in these cases it really is *man's wrong doing which leads to human suffering*. When the children of parents who have done what was wrong, go on doing only what is right through several generations, their offspring at last cease to suffer, and become altogether healthy and sound. The burthen of the fathers' sins is then, at length, mercifully taken off from their shoulders.

Having listened patiently to this little sermon, you would now like me to come to the point, and show you some of the dust and dirt which are scattered

around the living body, and which at times get into the machinery to the damage of its working. First of all, in my endeavour to do this, I should like to make you quite comprehend the possibility of there being very weighty matters pressing close round you, which you nevertheless are entirely unable to see, even in bright daylight. Just come out with me, here, upon the road. How pleasant and fresh the day is. Do you not feel the gentle breeze fanning your cheek as you turn up the lane? Yet you cannot see the breeze! What is it, then? Certainly it is *something*, for it touches and even presses against your skin. But it is something, too, which has weight and power of its own. Observe how it shakes the leaves of the trees as it sweeps past them. It is, as you know, the same unseen breeze which also drives round those great mill-sails yonder with such violence, and which grinds as much corn in that mill, as could be ground by the efforts of a dozen horses, kept up to their work by the whip. We have not had to move far, then, before we have come upon something which we cannot see;—before we have proved to ourselves that we must not altogether depend upon our eye-sight for information, even concerning the existence of surrounding things.

But what is this? The breeze is not so fresh here as it was just now at the end of the lane. There is some very disagreeable smell now floating upon it. Here again we can see nothing, any more than we

could when we had only the fresh breeze blowing around us. But there must be some cause for the unpleasant odour. The smell gets stronger and stronger as we approach this bank. We climb over the bank, and we find on the other side, in the corner of a field, a manure-heap, from which the smell is evidently poured out. NOW THAT SMELL IS REALLY A VAPOUR, BRED OF DECAY IN THE MANURÊ, AND THEN STEAMING UP FROM IT INTO THE AIR. If our eyes were as sharp as our noses, we should be able to see a great host of little bodies rushing up from the manure, and scattering themselves through the air. It is because some of those little bodies strike upon the lining of our noses, as they are drawn in by our breathing, that we smell the unpleasant odour. The nose feels the touch of those bodies as a smell.

Wherever substances which have been alive, are dead and undergoing decay, vapours of this kind are bred and steamed forth. This is the way in which dead things are got rid of; they turn to vapour and crumble to dust. If we could see all the vapours that are being bred of decay, we should be sensible of a thick mist covering the entire face of the land and sea, and rising up from it continually. Some of these vapours have strong smells, like those which issue from the manure-heap; but some of them cannot even be smelt, any more than they can be seen.

But these invisible vapours bred of decay, were not intended to be breathed by living creatures; and,

indeed, cannot be breathed by them without mischief. We are able to stand near the manure-heap for some time without taking any particular harm, because the vapours are scattered as fast as they are formed, and are mingled in small quantities with large quantities of pure air. We thus breathe air tainted with these vapours, rather than the vapours themselves. But suppose all the air were taken away, and you were left standing with nothing around you but these vapours, what do you think would happen to you? You would be dead in less than three minutes, killed by their poisonous power. THE VAPOURS WHICH ARE BRED IN DECAYING SUBSTANCES ARE POISON-VAPOURS.

You would like to know why it is, as these poison-vapours are poured out in such quantities from all decaying substances, that you do not see people dying all round from breathing them. Did I not tell you, in the case of the poison-vapours of the manure-heap, that you could breathe them because they were freely scattered into the fresh air? Now just come a few yards this way. You observe the smell of the manure grows less and less. Here you cannot any longer perceive it, although the wind is actually blowing over the manure-heap towards us. The fact is, THESE POISON-VAPOURS CANNOT BEAR THE PRESENCE OF PURE AIR. Pure air is the natural *antidote* or remedy for their poison. The instant it mingles with them it begins to destroy their hurtfulness, and in a few moments it has so thoroughly

accomplished this good work that no single trace of mischievous power remains.

Has it ever occurred to you to ask yourself why the pleasant wind blows over hills and fields, and through lanes and streets? You know very well that the wind always is blowing, more or less. Go out when you will, you find it, if you turn the right way. It is the most uncommon thing in the world for the air to be altogether still. The fresh wind blows so constantly over hill and plain, because God sends it to sweep away and destroy the poison-vapours that steam out from decaying substances. The breeze is God's invisible antidote to the invisible poison. THE PLEASANT WIND BLOWS IN ORDER THAT THE AIR MAY BE KEPT FRESH AND PURE.

In the open air the fresh wind very soon scatters and destroys all poison-vapours. But civilized men do not dwell always in the open air. The wind sometimes makes them feel cold, so they build themselves houses to shut out the wind. To-night, before you go to bed in your small sleeping room, you will close the windows and the door; and you will think, when you have done so, that you have shut out everything which could harm you, with the cold. But what will you say to me if I show you that after you have closed the windows and the door, POISON-VAPOURS ARE BRED IN GREAT QUANTITIES IN THE ROOM WHERE YOU ARE LYING? and that so long as you remain in it, they keep gathering more and more strength, and

becoming more and more dangerous. Just come back with me to the cottage, and let us look at the room in which you were sleeping last night. The beds, you believe, are not yet made—never mind that. I often go into rooms under such circumstances, and perhaps upon this occasion it may be even better for the purpose I have in view, if I find the chamber in disorder. At any rate let us go upstairs and take our chance.

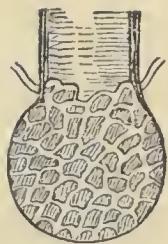
Sure enough you have been at great pains here to keep the cold from getting in. There is only one casement in this low small room, and that casement has not been unbarred since yesterday. I do not need to be told this. I make the discovery myself; for you have also kept something from getting out, which had better have been away. I feel at once this is not the same kind of air which we were breathing just now in the open garden. Indeed, I cannot remain in the room without opening the window. There; I throw open the casement, and in a few minutes the air will be as fresh here as it is outside of the house.

Now what do you think it was that made the air of this room so unpleasant? It was the poison-vapour with which it was laden, and which had steamed out of your body mixed with your breath during the night. POISON-VAPOURS ARE BRED IN THE BODIES AND IN THE BLOOD OF ALL LIVING ANIMALS, just as they are in manure-heaps. All the working organs of your frame being exhausted by use, undergo decay and are turned into vapour, and that vapour, being

bred of decay, is *poison-vapour*, which must be got rid of out of the body as quickly as it is formed. Living bodies are worn away into vapour by working just as mill-stones are worn away into dust by grinding. You would see them waste under work, if it were not that they are repaired by food. You wonder, then, that as this vapour is poisonous, living creatures do not destroy themselves by the poison they form in their blood? Occasionally human creatures do so destroy themselves, as I shall presently show you. But the merciful Designer of the animal frame has furnished a means by which, in a general way, the poison is removed as fast as it is formed. Can you not guess what this means is?

God employs the same plan for driving away poison-vapours from the inside of living animal bodies, that He uses for the purification of the air in the open country. He causes a current of air to circulate through them. Notice how, while we are talking together, our chests heave up and down. You know this is what we term breathing. Now, when we breathe, we first make the insides of our chests larger by drawing their walls and floors further asunder. Then we make them smaller by drawing their walls and floors once more nearer together. When the chest is made larger, fresh air rushes in through the mouth and wind-pipe, and through the twig-like branches of this pipe, until it fills a quantity of little

round chambers which form the ends of those branches. Look at this picture. It is a representation of one of these chambers, greatly magnified, in order that its character may be readily seen. The wind-pipe branches out into several millions of fine twig-like tubes, and then each tube ends in a blind extremity, or chamber exactly like this.



Do you observe that the air-chamber in the picture is covered by a sort of net-work, stretched tightly over it? That net-work is formed of blood-vessels, through which the blood is constantly streaming, driven on by the action of the heart. This blood sucks air from the air-chambers into itself, and carries that air onwards to all parts of the living frame. But the blood-streams in the net-work of vessels also steam out into the air-chambers poison-vapours, which are then driven out through the windpipe and the mouth. Thus the breath which goes into the mouth is *fresh* air; but the breath which comes out of the mouth is *foul* air. Air is spoiled, and, as it were, converted to poison, by being breathed; but the body is purified by the breathing, because it is its poison-vapours that are carried away, mingled with the spoiled air.

This, then, is why men breathe. BREATHING IS THE BLOWING OF A FRESH WIND THROUGH THE LIVING BODY FOR THE CLEANSING AWAY OF ITS IMPURITIES. The purifying part of the air which is breathed actually circulates with the blood through all parts of the frame.

EXERCISE QUICKENS AND EXALTS THE CLEANSING POWERS OF THE BREATHING—and this is why it is of such great importance to the health. When you go and take a brisk walk in the open air, you increase the force of the internal breeze. The exertion makes your chest expand to a larger size, so that it can admit more fresh air, and it also causes your blood-streams to course along more rapidly, so that a greater abundance of the air is carried on through your frame.

A very large quantity of fresh air is spoiled and rendered foul by the act of breathing. You, yourself, spoil not less than a gallon every minute. IN EIGHT HOURS' BREATHING A FULL-GROWN MAN SPOILS AS MUCH FRESH AIR AS SEVENTEEN THREE-BUSHEL SACKS COULD HOLD! If you were shut up in a room seven feet broad, seven feet long, and seven feet high, the door and windows fitting so tightly that no air could pass through, you would die, poisoned by your own breath in a very few hours; in twenty-four hours you would have spoiled all the air contained in the room, and have converted it into poison, provided you could have lived therein so long.

One hundred years ago the English were allowed by the Great Mogul or Emperor of India, to build warehouses and dwellings in certain parts of his Empire. One of these mercantile settlements or factories, as they were called, was planted on the bank of a large river just where Calcutta, the capital city of Bengal, now stands.

In the year 1756, the Nabob, or tributary king of the province of Bengal died, and was succeeded by a very young man, who bore the outlandish looking title of Surajah Dowlah. This young barbarian cast a covetous eye on the neighbouring British factory, and one summer day, attacked the place suddenly with a large army. The small party of English who were in the factory, despairing of their ability to effect any successful defence, tried to make their escape to some ships which were lying in the river.

Several of the fugitives reached the vessels in safety. But in the confusion of the flight, 146 individuals fell into the hands of the victorious Nabob. These, his officers thrust for the night into a small cell, which was used as the prison of the fortress, and was known under the dismal name of the Black Hole of Calcutta. This cell had but two small square holes for windows, and was only 18 feet long and 14 feet wide, so that the last person of the 146 had to be crushed in upon the rest with violence, as the door was closed and locked. The anguish of the crowded captives soon became so great, in this vile hole, that the neighbourhood resounded with the noise of their struggles and cries. As the night wore on, these sounds, however, gradually sunk into silence. When the morning came, and the door of the prison was opened, the reason of this silence became sadly apparent. In the place of the 146 prisoners who were shut up on the previous day, they took out 123 corpses, and 23 mis-

rable beings, who looked more like ghastly spectres than men, and who could hardly be said to be alive. This occurrence furnished one remarkable instance of the deadly power of the poison-vapours which are poured out from the inside of living beings. Now I will tell you about another case of a similar kind.

A few years ago, a vessel started from Cork in Ireland, to take a large number of emigrants to a ship just about to sail from Liverpool. A violent storm sprung up in the night, as the vessel was crossing the Irish Channel, and the captain, fearing that the alarmed passengers would interfere with the sailors, and render it difficult to work the ship, sent them all below into the hold, and covered them closely down with the hatches. The imprisoned passengers soon found that they were suffocating, and called and knocked loudly for help, but their cries either were unheard or disregarded. In the morning the hatches were removed, and to the horror of the captain and his crew, the hold was found half full of dead bodies and dying people, instead of containing living men and women. Such are the fearful consequences which follow, when human beings are forced to breathe the same air over and over again.

You are very much shocked, both at the savage cruelty of the Indian tyrant, and at the carelessness and ignorance of the Irish captain. But what will you think of yourself if I now show that you do, in a small degree, every night, what they did on so

large a scale? What was it that caused the closeness of this room before we opened the window? It was the presence of precisely the same kind of poison, as that which killed the prisoners at Calcutta, and the passengers in the hold of the ship. That poison did not destroy you in a single night, only because it had not gathered in sufficient strength to do so. Your room was not more than half as large as the Black Hole of Calcutta, but there were only two of you shut up in it instead of 146. The air of your room was merely hurtful instead of being deadly. But the fact still remains. WHEN YOU ROSE IN THE MORNING, THAT AIR WAS NOT FIT FOR A HUMAN CREATURE TO BREATHE.

When you rise to-morrow morning, just go out of doors for five minutes, and observe carefully the freshness of the air. That air is in the state in which God keeps it for breathing. Then come back suddenly into your close room, and your own senses will at once make you feel how very far the air of your chamber is from being in the same wholesome and serviceable condition.

This is one way, then, in which people produce derangement in their bodies, and cause their works, or organs, to get choked up and clogged. They are not careful always to keep fresh air immediately around them. They suffocate themselves slowly; taking, perhaps, a long time to complete their task, but, nevertheless, accomplishing it none the less

surely. Individuals who dwell in crowded towns, and, therefore, have to live by day as well as by night in close impure apartments, go down to their graves, even before they have reached their prime; and their thin pale faces, dull sunk eyes, and languid movements, tell they are doing so, with painful clearness. It is well known that people who dwell in towns and work in close rooms, as a rule, die seventeen years earlier than men who dwell in the country, and work in the fields by day.

Country folks escape this *severe penalty*, because even when they half smother themselves by night, the thoroughly fresh air in which they spend the day goes a great way towards the correction of the mischief. Still they are by no means free from *all penalty*. You yourself have suffered from breathing bad air. Do you remember last autumn, when I came to see you sick in bed with the fever? Do you recollect how your limbs ached, and your skin burned then, and how you tossed restlessly from side to side, without being able to sleep, your mouth and tongue being brown and parched with a dryness which water could not moisten? You could not raise your head from the pillow; and once when I asked you how you felt, you answered me by telling me something about the corn stacks and the last harvest, being quite unconscious of what you were saying. What do you think was the matter with you then? Your body and blood were full of poison-vapour. And what do

you think had made them so? Why fresh air had not done its work of purification as it ought. You had been breathing a great deal of impure air, and were paying the penalty for having done so. If you could have seen the prisoners in the Black Hole of Calcutta an hour or two before they died, you would have found them exactly in the same state.

The term "fever" is taken from a Latin word which signifies "to burn." THE SKIN AND THE BODY FEEL BURNING HOT IN FEVER, BECAUSE IMPURE POISONOUS BLOOD IS FLOWING EVERYWHERE THROUGH THEIR VESSELS, in the place of pure blood, and the blood is poisonous because it has not been freed from its poison-vapours as fast as they have been bred in, or communicated to, its streams. In the worst forms of fever the blood gets so impure that it steams out, through the breath, vapours which are able to produce the same kind of disease in other people, and which are, under these circumstances, termed INFECTION. The infectious poison-vapours of fever get so strong when they are received into close rooms, and are not allowed to be blown away, that they often kill persons who breathe them in that state, very quickly.

But you now want me to explain how all the mischief, which results from breathing foul air, may be prevented. Come down with me into the garden, and creatures that you believe to be of far inferior powers to yourself shall give you a lesson.

You keep bees. Here is a hive, I see, crowded with

the busy insects. By the numbers that I observe clustering about the low arched door, and bustling out and in so incessantly, I learn that the industrious little fellows must be very closely packed together in their straw house. There must be many thousands of them dwelling together in a space that cannot, at the most, equal more than a couple of square feet; and there is not a single window in the straw wall; no opening of any kind but the low, and half-choked entrance. Really if those bees need to breathe, you who have furnished them with their dwelling must be nearly as bad as the cruel Nabob, who shut up his prisoners in the Indian Black Hole!

Those bees certainly do need to breathe every bit as much as men and women; and what is more, they manage to breathe ten times better than you do at night. Notwithstanding all the crowding there is within their close dwelling, the air never gets there into the poisonous state in which the air of your sleeping room is by the morning. The bees take care that it shall not do so. Just bend down your ear and listen near the hive for a minute. Do you hear that incessant low humming? That is the bees hard at work, making an artificial wind. It is the sound of a couple of score of broad, stiff fans, flapping to and fro with great rapidity. Look, I drop this piece of light thistle-down near the door of the hive, and you see it is at once blown away from it by a steady draught. If you could see through the straw walls,

you would discern twenty little sturdy fellows holding on to the floor of the hive with their feet, just within the door, and flapping their wings backwards and forwards without a moment's pause. Now and then one or two tired insects drop out from the line of the fanners, but their places are immediately filled by fresh recruits, who lay hold of the floor and fall vigorously to work with their wings. This is the appointed band of air-purifiers, plying their business for the good of the entire community, and wafting a fresh breeze continuously through the hive. The bees take it by turns to carry on this necessary labour, and some of them are always at it. The humming caused by the rapid vibrations of their fans, scarcely ever ceases. It has been ascertained that air taken from the inside of a crowded hive, is quite as pure as the fresh air that floats in the open space around; so perfectly do these little earnest workmen accomplish their purifying task

The industrious bees, then, are an example to mankind. IF PEOPLE DWELL IN CLOSE ROOMS, THEY MUST CAUSE AN ARTIFICIAL BREEZE OF FRESH AIR TO BLOW THROUGH THEM. Having shut out the great wind, that it may not chill too much by its uncontrollable currents, they must introduce such a little wind as they can keep thoroughly under control, but which nevertheless is sufficient to perform the office of purification as far as it is required. This process of causing an artificial wind to

blow through the inside of a dwelling is called *ventilation*, from a Latin word which signifies "to blow" or fan with the wind.

In very hot climates where dwellings need to be ventilated for the sake of coolness, as well as for purification, men follow precisely the example set by the bees. They hang up broad and stiff canvass fans, which they call *punkas*, near the ceiling, and cause these to flap backwards and forwards constantly, by pulling them to and fro with ropes. In more temperate climates, it is rarely found necessary to take all this trouble, for the air readily makes currents of its own accord inside of rooms, if only allowed to do so. All that is necessary is the furnishing a free passage into the room, and a free passage out, and it will then make a clear march through. One opening will not do, when fans are not kept going, because then the entering and departing air would meet face to face and obstruct each other. THERE MUST BE "IN" AND "OUT" DOORS, just as one sees in much frequented offices and banks, in great towns.

A very effectual plan for securing the ventilation of a dwelling room—consists in carrying a pipe of perforated zinc across the house, from outside wall to outside wall, just beneath the ceiling, allowing the ends to pass through the walls quite into the open air; then whichever end of the pipe chances to be most towards the quarter of the heavens from which

the wind is blowing, should be closed with a plug, a free passage being left for the escape of the heated air through the opposite end. A number of holes should also be made through the door, near its bottom, until altogether they afford as much room to passing air as the inside bore of the zinc pipe. If you cannot manage to fix such a zinc pipe across the ceiling, why take out one or two of the panes of the window, and put into their place, plates of what is called *perforated zinc* (zinc plates pierced full of holes), such as you may buy for a trifle at any ironmongers. That is the next best thing you can do.

As soon as some arrangement of this kind has been completed, you will find that the air begins to move gently through the room, cold fresh air coming in through the holes in the door, and warm impure air being pressed out before it through the perforated zinc tubes or plates. This takes place partly because the external wind rushes, in its hasty way, against the openings through which the air is intended to enter, and forces itself in; but also, and more particularly, because the inside air gets warmer than the outside, and is then compelled to shift its quarters on that account.

The air contained inside of inhabited rooms gets warmed by the bodies and breaths of the persons living there. THEN IT IS LIGHTER, BULK FOR BULK, THAN THE COLDER AIR OUTSIDE, for warmth stretches and lightens every thing. But as heavy things fall or

press down to the earth more strongly than light ones, THE COLD AIR ALWAYS SQUEEZES INTO THE ROOM THROUGH THE LOWER OPENINGS, and pushes the warm impure air out before it, through the upper ones.

When you light a fire in your room during cold weather, it makes a quick and strong draught through the room, for the same reason. Fires, indeed, are among the most powerful ventilators that can be brought into play. Let your fire out, and go on sitting in the room with two or three of your neighbours, and you will find the air of the room will be close and foul in half-an-hour, although it was quite fresh before. While the fire is burning, the chimney takes upon itself the office of the holes in the zinc tube or zinc plate fixed in the window, and the heated air of the room is pushed up through it by the fresh cold air which rushes in through all other openings and crevices. It is only in rooms where no fires are burning—as for instance, in your sleeping room—that holes through the walls and windows can serve as *outlets* for impure air.

But if you live with several companions, in small rooms, as some workpeople are compelled to do by their occupation, those rooms cannot get properly ventilated, even although fires are burning. Some of the poison-vapours, poured out from your living bodies with the breath, are so light that they are at once driven up to the top of the room, and collect

there gradually, spreading lower and lower as they become more abundant. They cannot get out through holes made in the walls or windows, because, as we have seen, the fire causes streams of cold air to press in there.

Dr. Arnott has, however, contrived a plan to ensure perfect ventilation even in small and crowded rooms, provided fires be burning.—This plan consists in making an opening into the inside of the chimney, near to the ceiling, and fixing a balanced valve in it in such a way that the valve-plate is opened by outward draughts, but immediately closed by inward ones. Then the impure vapours lurking near the ceiling, are continually being swept away, into the current of the chimney, through this valve.*

* A very perfect circular ventilating valve is sold by Messrs. Bailey, 272, Holborn, ready to be fixed to the chimney-shaft, for 7s. 6d. It should be understood, however, that in order that this valve may work correctly, it is necessary for the throat of the chimney, just over the fire place, to be contracted. If there be a *very large* draught into the chimney over and through the fire, there will be a tendency to a downward current through the valve, to help to supply the inordinate demand below. When the ventilating valves fail, and smoke falls back from the chimney through them, it is commonly because this has not been attended to. The entrance to the chimney-shaft should be narrowed over the fire, until a square hole, only about four or five inches wide, is left for the passage of the smoke and hot air; and then a low arch should be fixed, as a sort of blower, over the top bar of the grate, to quicken and steady the draught. When this arrangement has been properly made, it will be found that the fresh air which enters the room, escapes by two streams into the chimney, a part passing over the fire, and another part flowing steadily and continuously through the valve.

You are sure you have no money to spare to buy valves, and zinc tubes and plates, or to pay to workmen for making holes in your walls, and in your doors and windows. I admit that properly these trifling things should be done at the expense of the landlord to whom the house belongs. It should be as much his duty to make a house fit to live in, so far as due ventilation is concerned, as it is to keep it dry by covering it with a roof of tiles or slate. As landlords, however, are commonly themselves ignorant about these matters, you must learn to look to the affair for yourself. You will be the sufferer if the right thing be not done, therefore it is alike your interest and your duty to see that it is done.

Suppose then that you have a hard landlord who will do nothing for you, and that you are so poor you cannot spare a shilling or two for the purchase of metal tubes or plates. Then I will tell you what I would do, if I were in your shoes. I would borrow a large gimblet of the carpenter, and I would bore a row of holes through the upper part of the window frame in my bed-room, just above the glass, sloping them downwards a little, so that the rain may not be able to run in; next I would never quite shut the door of the chamber, and I would bore other holes through the frames of the windows down stairs, to act as channels of inlet. A few rough pegs of wood would serve to close some of the holes, if at any time too much air entered the room in consequence of a

strong wind blowing outside. This is what I would do, rather than I would submit to be *poisoned* at night, because I was poor.

A single round hole, a little more than half an inch across, would allow as much air to pass through it, as would be sufficient to supply the breathing of one person, provided the air were driven along by the movements of a fan, or by other mechanical contrivance, with the force of a very gentle breeze. Generally, however, it does not move so fast as this through rooms, when only caused to do so by the greater pressure of external colder air. It is, therefore, better that the ventilating openings, both for inlet and departure, should altogether make up much more than a hole half an inch across.

IT IS NOT POSSIBLE TO HAVE TOO MUCH FRESH AIR IN A ROOM, provided only an uncomfortable and chilling draught is not allowed to blow upon the body of the inhabitant. You may easily prevent any discomfort or mischief from draught, even where a great abundance of air is admitted, by hanging a curtain to catch it and turn it aside. You will find, however, that there is very little chance of any troublesome draught when no fire is burning in the room, to make the air rush in with increased power, for it is fires, as you will remember, which cause quick and strong currents.

THE WARMER AND STILLER THE EXTERNAL AIR IS, THE MORE DIFFICULT IT BECOMES TO SECURE FREE

VENTILATION THROUGH THE INSIDE OF ROOMS. In the calm hot nights of summer, the windows of sleeping rooms should on this account be left partly open all night long. It is better to breathe air moistened with night dew than it is to breathe air laden with poison-vapours.

But if it be important when people are well that they shall have an abundance of fresh air moving through their dwellings, it is of FAR GREATER CONSEQUENCE THAT THERE SHALL BE A THOROUGH VENTILATION KEPT UP IN ROOMS WHERE THERE IS SICKNESS. In all kinds of fevers the blood is overloaded with poison-vapours, and these cannot get out of the body unless they are blown away by pure air. The sick person cannot be freed from the poison-vapours that are clogging up his vital organs until fresh air is supplied abundantly. Do you remember what it was that first made you better, when you had the fever last year? Can you not recal to mind how all the doors and windows of your room were kept constantly open, and how angry I was whenever I came to your chamber and found them fast closed! Have you forgotten how delicious the fresh air felt to your parched and poisoned frame, and what luxury there was in the clean linen when supplied to your body and to the bed, and in the cold water when it was sponged over your skin?

If ever you are called upon to attend a neighbour or a relation who has to suffer from infectious fever, as

you then did, be sure you furnish to that sick person the same comfort and alleviation which were provided for yourself. Let this be your

Plan for Nursing the Sick,—Open wide the doors and windows of the chamber. Keep the body of the patient and the room very clean. Change the linen both of the person and the bed very often. Allow only the very simplest kinds of food and drink to be given, and that in small quantities at a time. Prevent all noise and confusion around the bed. There are very few persons indeed who will not recover speedily from attacks of even the worst kinds of fever, if this simple and prudent plan of treatment is steadily pursued.

The poison-vapours of fever and other infectious diseases are very deadly when in their greatest strength, but remain so for a very short time when left to the influences and operations of nature. They cannot bear the presence of fresh air. If they are mixed with a great abundance of it as they come out of the mouths of sick people, they directly cease to be dangerous poisons. ALL THAT IS NECESSARY TO PREVENT INFECTIOUS FEVERS FROM BEING COMMUNICATED FROM PERSON TO PERSON, BY MEANS OF THE BREATH, IS TO TAKE CARE THAT FRESH AIR IS CONTINUALLY PASSING THROUGH THE SICK ROOM. Attendants and visitors may remain with perfect safety in rooms where even the worst kinds of fever are prevailing, if they keep all the doors and

windows of the chamber open, and are careful not to catch the breath of the patients until it has passed through some two yards of space, where there is perfectly pure air.

Such then is the "WORTH OF FRESH AIR." It keeps the body healthy and strong. It blows away and destroys the invisible and dangerous poisons which are steamed forth from putrid and decaying matters, and which are to the delicate organs of the living frame, much worse than dust and dirt are to clock-work. In disease it is nature's chief remedy ;—the best medicine of the best Physician, furnished gratis, because He is full of bounty, as well as of great skill. Never let it any longer be a reproach to you, that you ungraciously turn away such a precious gift and priceless boon from your doors. Rather fling wide your windows, as well as your doors, and welcome it to your heart. GO TO THE BEE, CONSIDER ITS WAYS, AND BE WISE !

THE USE
OF
PURE WATER.

THE USE OF PURE WATER.



Two centuries ago, London was a very large city, although nothing like so large as it is at present. Four hundred and fifty thousand people were then living in it, in tall houses, which were packed very closely together, so that they formed narrow streets.

But no pains were taken at this time to carry away the dirt and waste matter, that necessarily gathered where there was so vast a crowd of living beings. Some little of it was washed down into the river Thames, when it rained; but by far the greater part of it collected in heaps, and lay in all sorts of holes and corners, decaying and putrefying, and filling the air all round with poison-vapours, which no one could see, but which every one was forced to take into his mouth when he opened it. London was then one of the most crowded and dirty, as well as one of the largest cities in the world.

In the year 1665,—that is, nearly two hundred years ago,—a dreadful disease broke out all at once in this crowded and dirty city. People who caught this disease sometimes died in a moment, as if they had been killed by a blow; and hence it was called

“the Plague,” a word taken from an old Greek term, that signified “to strike.”

The Plague struck London so awfully in this sad year, that in a short summer a hundred thousand people, out of its four hundred and fifty thousand inhabitants, died. At one period, a thousand perished every twenty-four hours! A single small parish buried six hundred dead in a week! On the worst night of the pestilence, four thousand human creatures who were living when the sun set, had ceased to breathe before it rose again!

All kinds of business stopped in the city. Most of the inhabitants fled into the open country, the rest shut themselves up in their houses. Carts used to go round every night to gather the dead bodies, and to take them to large holes dug in the ground to receive them. At last the dead bodies were so numerous that the men who went round for them with the carts, ceased to be able to keep an account of their numbers. It is known, however, that in two short months, fifty thousand bodies were buried in this miserable way.

Two hundred thousand people left their houses, and lived in the fields and forests. When these fugitives returned in the autumn, after the pestilence had ceased, and went to look for some of the friends whom they had left behind them, whole families proved to have been so completely swept away, that not a single person bearing their names could be found.

When the hundred thousand people died in London, in the year 1665, men fancied that God had visited

them with death as a punishment. Several individuals ran about the streets nearly naked, crying with a loud voice, "yet forty days and London shall be destroyed." One poor creature was seen rushing about everywhere, and calling out continually, with a voice and face full of horror, "Oh! the great and dreadful God."

These miserable beings, however, were wrong. They were crazy with fear, and uttered words of ignorance and falsehood, and not the words of truth. London was not destroyed in forty days, and the Great God was merciful, and not dreadful. HE had sent them—not the plague, but the fresh air and the pure water, which would have prevented the pestilence, if these blessings had been allowed to do their cleansing and purifying work.

London has now more than five times as many people dwelling in its streets as it had then. There are now in it no less than twenty-one square miles of houses, packed as closely together as they can stand; and in these houses, two millions and a half of human creatures live.

But now, hundreds of miles of channels are cut out under the streets and houses, to carry off waste matters; and millions of gallons of pure water are brought into the houses every day, and poured down these channels. Nearly a tenth part as much pure water as flows down the Thames, is now running through the houses of London continuously, to wash away offensive and decaying substances, along pipes

laid down for the purpose. More than *twenty millions of gallons* of pure water are made to stream through the London houses, every day, by machinery provided for the purpose, besides probably half as much more which is drawn from the pumps and wells. The consequence of all this is that London, with its greatly increased crowd of living beings, and with its much larger production of waste and dirt, is now never visited by any disease so dreadful as that old Plague.

But since the plague never returns now to London, you think, perhaps, it is because the fearful disease has at length worn itself out, and not because London is better kept than it used to be. But how, then, will you account for this fact? There are cities at the present time, in Egypt and in Turkey, which are just in the same filthy and miserable state that London was in, two centuries ago; and in these the plague still breaks out almost every year, sweeping away hundreds of human beings at each visitation.

As recently as the year 1852, a severe disease broke out in a small town close to the outskirts of London, where sixteen thousand people lived; in a very short time, two thousand out of the sixteen thousand became ill, and seventy persons died. A very clever doctor was sent down from London to find out what was the cause of this illness, and he soon discovered that the channels, which ought to have carried away the waste and decaying matters from this town, were choked up, and could not perform their office.

When water was poured down into these channels,

it squeezed up out of them quantities of light and invisible poison-vapour, which had been formed in the channels from the decaying matter. This invisible poison, being forced out before the water, bubbled up back into the houses, and poisoned the air their inhabitants had to breathe. Even when the fresh rain that fell on the house-tops and in the streets, ran down into the channels, it too made the poison-vapour bubble back into the houses.

In a house, where there was a school, in this little town, a tall pipe was carried up from the channel for waste water, higher than the roof, and one of the teachers climbed up and put his face over the end of the pipe, to find if any thing came out from it. He was at once seized with sickness, as if he had been blown upon by the breath of the Plague. But in this town, the clever and wise doctor did not let the people run about the streets, crazy with fear, and attributing the calamity to the anger of God. He showed them what was wrong, and set them to make wrong, right. He had the choked-up channels cleared out and put in order, and plenty of water poured down them to wash away the poisonous filth, and so only one person in every two hundred and thirty, died; instead of one in every five, as was the case in London at the time of the Plague.

The hundred thousand persons who were destroyed in the year of the great plague, in London, were really as much *killed by dirt and ignorance*, as they were by the pestilence.

By severe lessons of this kind, men have been taught that when great crowds of living creatures dwell close together in cities and towns, pipes or channels must be made underground to carry away dirt and waste substances; and that those substances must be constantly driven out through such channels as fast as they are put into them, otherwise more poison-vapours will be poured forth in a narrow space than the fresh air will be able to master and destroy at once. The channels made under houses to receive and carry away dirt and waste, are called "*Sewers*" and "*Drains*."

Now, you, my friend, who live in a town, have a house where sewers and drains of some sort or other have been provided, to carry away decaying poisonous filth; accordingly you throw all waste matters into these drains, and think that is all you have to do, and that you have got rid of them as it was meant you should, and have put them quite beyond the power to do you harm. In this, however, you may be altogether in the wrong; too often you have done nothing of the kind.

Waste matter has no legs, or wheels; it can neither run nor roll away. It will fall *down*, so far as it can get, but it will not *move onwards*, unless driven, or forced to do so. You know very well that if you want a spadeful of earth, or cinders moved, you put a spade or shovel under it, and lift it up, and carry it away.

The waste matters that are put into the sewers and drains, must also be carried away through them.

otherwise having fallen into the drain-pipes, they will go as far down them as they can, and then will lie there choking up the passage, and preventing everything that is added from passing further that way. But you say, how are you to make them pass on if they choose to lie there so obstinately, after you have thrown them in? That is the point to which I want to bring you. There is really no difficulty in the case, if you only see the matter in the right light. Means have been provided, all ready to your hand, if you will but use them as it was meant you should, whereby you may drive away together the danger and the dirt.

The winds which blow over the face of the earth, to keep the air fresh, have had a very powerful help-mate appointed, to aid them in their cleansing labours. THE RAIN THAT IS POURED DOWN FROM THE SKY IS THE HELPMATE OF THE WINDS IN THEIR PURIFYING WORK.

When rain falls on the ground, it runs to the lowest places it can find, and makes little rills and rivulets, and so at last flows on into the wide basin of the sea. But as it does this it takes with it all the dirt and decaying matters that lie in its way.

When it rains, God, in his mercy and love, is refreshing and cleansing the air and the ground. We most of us know this very well, but rarely indeed do we think how constant and wonderful the care is that He bestows, while performing this kind service in our behalf.

The quantity of cleansing rain that is poured down

upon the earth from the clouds, in the course of a single year, is so great, that we can hardly imagine how enormous it would seem if collected together. There are some facts, however, which will help to shew how surprisingly vast this quantity is.

All the rivers of the earth are fed by the rain. Rivers, indeed, are nothing but rain which has fallen upon high grounds, and which is hastening along in the channels and grooves which it has hollowed out, towards the great basin of the sea.

The largest river in England runs through London, and is called the Thames. This river is two hundred and twenty miles long, and drains away the rain from six thousand square miles of land. Now, if the river Thames emptied itself into a cistern, instead of into the sea, that cistern would need to have nearly six acres for its bottom, and to be as high as it was broad and long, only to be able to hold as much water as it would receive in twenty-four hours. More than two hundred solid acres of water roll down the Thames, into the sea, every day. Five solid miles of water pour through its channel in a year.

But this great Thames is, after all, nothing more than a little brook, when measured by the side of other rivers. There are one hundred rivers upon the earth larger than the Thames, and some of these very much larger indeed.

There is one river in America that is two thousand miles long, and that pours out into the sea every

twenty-four hours, more water than a cistern half a mile square and half a mile deep could hold.

Another still more mighty American river is nearly five thousand miles long, and pours out, into the sea, as much water in a single day, as the Thames does in a year. This grand old stream was known to the early inhabitants of the land, under the name of the "Father of Rivers."

The Father of Rivers itself, too, is in its turn, only a pigmy, when compared with another American stream which is yet more vast, and which pours out into the sea, through a mouth that is thirty miles wide, as much water in five hours as the Thames does in a year. Its fresh floods rush out into the salt sea, five hundred miles from the shore; and, sometimes, leap up, against the opposing currents as a wall of water one hundred feet high, and with a roar that can be heard by sailors many miles away.

Besides these hundreds of great rivers that are always pouring their floods into the sea, day by day, and night by night, there are thousands upon thousands of smaller streams doing exactly the same thing.

If all the water which falls to the ground as rain, in England, in the course of a single year, lay where it fell, instead of flowing off as rivers into the sea, the dry land would be found to be covered up everywhere, to the depth of three feet.

If all the water which falls to the ground, in some parts of America, in the course of a single year, lay where

it fell, it would cover the face of the land, at the end of that time, to the depth of twenty-two feet.

If all the water which falls as rain, in some parts of India, lay where it fell, it would cover the ground to the depth of twenty-four feet in a year.

Thus wonderfully vast is the supply of water God has furnished for the constant washing of the surface of the earth. Now, I would have you seriously ask yourself the question, whether it is at all likely that the Almighty, who has planned the world, and has made everything in it so perfect, has been at the pains to send this great quantity of water for no purpose. I am sure you will at once feel that such cannot be the case, and that pure water must be for some use that is as great as the supply;—that, indeed, like fresh air, it is one of the chief blessings which God has sent, for the benefit of His creatures.

Like all the other blessings that God has given to man, water serves many purposes; but among these the one of cleansing away dangerous filth, is by far the most important. We have seen what has happened when water was prevented from doing its purifying work, where crowds of living beings dwell closely together. It would be of little consequence, that the mists and the rains should clothe the surface of the earth with grass and corn, if deadly plagues were constantly sweeping away the mouths that ought to be fed by the grain.

God, then, sends rain down, abundantly, upon the earth, to wash away decaying matters and dangerous filth, just as He sends the sweeping wind

to carry off and destroy the poison-vapours which are bred of decay; and it is only those covered places which man constructs for his dwellings, that are not thoroughly cleansed by the rain.

You, my friend, who choose to live under a roof, in order that you may preserve a dry skin and dry clothes, must however do, with regard to pure water, precisely what you do with regard to the fresh air. You must bring in, artificially, as much as is required for purposes of cleanliness. God has taken care that the great purifier shall be so plentiful that no human being in civilized lands ever can have any reasonable ground of excuse to offer for not employing it. You say you live in a house which has had no provision made for bringing in a supply of pure water, and that you cannot afford to buy pipes, and have them laid down. But are there no pumps and wells anywhere near? Or, if there be none at a short distance, would it not be better that you should go, even a long distance, and be at the pains to fetch water thence rather than live in filth, at the risk of attack from deadly disease.

Put the case in this way. Suppose that, some day, when you walked into your kitchen, or your bed-room, you found there a deadly viper, rising up on its tail, and opening its horrible jaws, with its poisoned fangs ready to be plunged into your flesh: would you be content to sit down close by, and leave it to perform its murderous work upon your body? Indeed you would not. You would start away from it, and

snatch up the first stick, or poker, you could lay hands on, and you would fight bravely and boldly to destroy it, and get rid of the danger that was threatening you. And yet you are willing to sit down with a viper not a bit less deadly, that is lying in wait for your life; and that is all the more dangerous, because you cannot see it. This viper, if you leave it in occupation of your house, will steal from room to room, and glide up the stairs, and lurk round your pillow, and hide itself in your very bed. In the dark hours of the night, when you are helpless and fast asleep, it will bare its horrid fangs, and plunge them, perhaps, into *your* flesh; perhaps into that of those who are dearest to you; and in the morning, a parching tongue and a burning cheek will show, too late, what has happened, and that the poison is festering in the blood. Yet, how much less trouble you would have to take, to make yourself safe from the attacks of this insidious viper-like foul air, than you would so readily take to rid yourself of the less dangerous enemy that you could see! A few pails of water, brought from the nearest well, every day, and poured down the house-drains, until everything that was dangerous and bad was washed clean away, would effect all that is required.

Remember, then, that sewers cannot carry things away when they are choked up. SEWERS MUST BE KEPT OPEN AND CLEAN BY CONSTANT ATTENTION AND CARE, IF THEY ARE TO DO THE WORK FOR WHICH THEY ARE INTENDED. If they are not kept open

and clear, they do not perform their work, but become actually mischievous, instead of being of service.

Choked-up sewers are mischievous, instead of being serviceable—worse, actually, than no sewers at all—for this reason; they act as reservoirs for large quantities of decaying substance, and also of poison-vapour, which is bred from these. Many persons who are quite incapable of allowing dirt and filth to lie about in their houses, nevertheless, live perfectly contented with a great amount of the same dangerous materials gathered together in pipes just beneath, simply because they cannot see them there. Choked-up sewers are, practically, so many holes, dug into and beneath the floors, for the reception and accommodation of poison; and water-traps, at the entrance of the drain-pipes, afford no protection from the hurtful vapours that are generated in them, because water, being heavier than the vapours, drives them out of the pipes, when it runs in. The expelled vapours cannot get onwards, through the choked sewers, consequently, only one course is left to them. They must rush back into the house, bearing with it disease and death.

What would you, my friend, think of the prudence and wisdom of an acquaintance who dug snug little nests behind the skirting-boards, and beneath the floors of his house, and then filled these with vipers, which, having no possible means of getting away provided for them, must of necessity return inwards, into the rooms of the dwelling, whenever they were

induced to leave their nests! Now, this is precisely what people do, who place refuse substance in drains that are choked up at their outlets. The bubbles which are, from time to time, driven back through the traps, are *poison-bubbles*; they are like venomous vipers stealing forth into the house, from underground nests, where they had been allowed to lurk.

There is a snake in hot countries which is of so deadly a nature, that it kills at once whomsoever it bites. This dangerous snake climbs among the branches of trees, and glides along under the grass, seeking stealthily for its prey; but God has placed some small pieces of loose gristle in its tail, which rattle together whenever it moves, and so give notice that the reptile is near. This deadly snake is thus heard when it cannot be seen, and at once avoided by all living creatures that know what its nature is.

Now, what the rattle in the tail of the rattlesnake is to the creatures that this snake preys upon, a bubbling sound issuing from trapped drain-pipes, or closets, upon water being poured into them, is to the inhabitants of the house; it is an indication of danger. A BUBBLING SOUND AT THE INNER EXTREMITIES OF DRAIN-PIPES, IS A SIGN THAT THOSE PIPES ARE CHOKED UP SOMEWHERE WITHIN, AND NEED TO BE IMMEDIATELY CLEARED. Never rest one minute, when you hear this warning sound, until you have traced the stealthy danger to its hiding-place, and driven it away.

Poison-vapours, however, have no warning rattles,

unless when they enter dwelling-houses in this stealthy way, through trapped drain-pipes. But they nearly always carry about them another mark, which just as surely betrays their presence, if it be duly noticed.

Whenever you go near to a manure heap, or an open cess-pool, do you not observe that an unpleasant smell arises from it? Often this smell is so strong that it at once drives you away. Now, this disagreeable smell is a constant accompaniment of the poison-vapours of putrefaction. It is, indeed, attached to them for the most merciful of reasons; namely, that men may have timely notice of the danger that is lurking near. It is like the rattle of the rattlesnake, having been made sensible to the nose, instead of to the ear.

Men ought always to avoid the threatening smells of putrefaction, as carefully as they do the threatening sounds of the rattlesnake. DISAGREEABLE SMELLS ARE INDICATIONS OF THE PRESENCE OF DANGER. Never allow them to remain in, or near to your dwelling. Never rest for a minute when you perceive them. Hunt them away from your homes, as you would the most venomous reptile that crawls.

When people live in the open country, there is not quite so much need for drains and sewers as there is, in the case of towns, because there are by no means so many individuals crowded together in a given space, and because also, it is then always easy to take waste substances away at once, and deposit them at some distance from the house, where there are no living

creatures to breathe the poison-vapours which steam off from them during their decay.

Still, even in the open country, it is absolutely necessary that decaying matters shall be removed from the neighbourhood of dwellings. If they are cast out just before the doors and windows, and left there, the poison-vapours that they breed, rush into the house every time those doors and windows are opened; and if there be a fire burning within, are sucked in continuously, through chinks and crevices, in the place of pure air.

I chance to know a large parish in the open country, in which there are not more than a thousand people, living in a space some two miles square. The land itself is a high flat heath, over which the wind sweeps with the greatest freedom. But there are now upon it rich fields, full of grass, and corn, and sweet clover, and green turnips. A pleasant stream of pure water runs through the parish one way, and a broad turnpike-road crosses it the other. Near to a handsome church, standing upon the top of a gentle hill, there is a house surrounded by a lawn, over which two fine old chesnut trees extend their seared branches through masses of young foliage; and in this house there lives a clergyman, who thinks of the bodies of his flock as well as their souls, and does all he can to show his parishioners how to value rightly the substantial blessings God has given them. Nature, indeed, seems to have furnished to this place every advantage that is needed for the preservation of health.

But, unfortunately, the cottagers in this parish have taken a perverse fancy into their heads, to make pits close to their doors and windows, into which they throw all the waste and refuse substances of their houses, leaving them to decay and putrefy there as manure. They have, generally, small gardens round their dwellings, but they dig the manure-pits close to their doors, so that they may not have to walk a few yards further when they have anything to throw in. Very often, too, there are pigsties, and even stables for donkeys and ponies, by the sides of the manure-pits. The immediate consequence of all this is, that when any one walks in among these cottages, he finds his nose offended, directly, by all kinds of foul smells. The people, themselves, get so used to these smells, that they do not appear to mind them. Sometimes, indeed, they seem to have been trained by custom, rather to like them than otherwise.

But there is also another consequence which follows in the company of these smells : the parish is, commonly, not free from infectious fever, for months at a time. I have seen this horrible disease again and again, stalk slowly through the parish, occupying months, and even years, by its progress ; *passing by clean and well-kept cottages*, but stopping at every one, where there were manure-pits and pigsties, and seizing from them victims, sometimes two and three, and sometimes more. I have known the fever to cling, for months, to the same dwelling, until manure-pits close by, were removed, either from their owners being at length

convinced of their hurtfulness, or because the clergyman, or the parish and medical officers interfered ; and I have then been an eye-witness to the fact, that the sick people almost directly got out of their beds, and in a few days, became quite well. I have known as many as twenty people die in the course of two months, in one small spot, in the parish where the holders of the houses were obstinate, and refused to part with their manure-pits. I remember a cottage, in particular, in which a labourer lived with his wife and five children. I went into this cottage one hot autumnal afternoon, when there was fever prowling near, to tell the poor man that his cottage was not fit even for a dog, or a pig to reside in, on account of the foul matters that were collected, both in front and behind. Three weeks afterwards I was in the house again. The man was then away, in the fields, at his work ; but his wife and four children were sick in bed, in two little, close, and badly ventilated chambers ; the fifth child, a young girl, being alone left to nurse them. In two more weeks I was there once more ; the girl who had been the nurse, was then herself ill in bed, with the fever, and she and her father were all that remained of the family of seven. Her mother and four brothers and sisters were all asleep beneath the sod of the churchyard. This sad instance I witnessed myself, but it is very far from being a solitary one, in this great country, which ought to be so free from sickness, favoured as it is by Providence, in all that gives value to life. Thousands upon thousands of people die in England, in the same way,

every year, poisoned through their own folly and ignorance.

Cases of this kind prove, that although the danger is less in open and thinly peopled country places, than it is in crowded towns, there is, nevertheless, great reason why even there pure water and fresh air should be allowed to perform their proper work of removing waste substance, and destroying poison-vapours. If you have any country friends with whom you can talk these matters over, tell them that the best thing they can do in order to escape entirely from the risk of such deadly sickness as infectious fever, is always to carry all waste and refuse substances to some distance from the house, every day, and bury them there, beneath the loose soil, mixed with a little quick lime, if they can procure it; then the poison-vapours, instead of being steamed out into the air, are sucked in and fixed by the soil and the lime, as fast as they are formed, until the rain comes to wash them away, through rivulets and rivers, to the sea, or to convey them to the rootlets of living plants, which are able at once to consume them; changing them from poison into nourishment as they do so.

There is another piece of advice, too, which you may give to both your country and your town friends; and which you may also, advantageously, share with them yourself. **ACQUIRE THE HABIT OF BEING ALWAYS PERFECTLY CLEAN.** Sweep away dust, and wash away dirt and filth, day after day, and week after week. Make no truce with them, for they are uncompromising enemies. If you do not remove them

entirely, they will punish you for your forbearance. It is quite true, that a little dirt does not do a great deal of harm; but it is also true, that people who do not mind a little dirt commonly get to bear a great deal of it. It is a very troublesome thing to be always trying to be a little clean. But it is a very easy thing to be always quite clean. People who have once learned the habit of cleanliness, carry it with them for ever afterwards, without being conscious even that they are doing so.

It is a very good plan for persons who have learned the value of thorough cleanliness, to go about, near to, and in their houses, in the cool of the evening; observing carefully, whether there are then any disagreeable smells which can be perceived. Very often UNPLEASANT ODOURS CAN BE DETECTED IN THE CHILL DAMP EVENING, in places which are entirely free from scents during the day.

So long as the warm sun is shining, it raises any poison-vapours that are in the act of being bred there, rapidly into the air, and scatters them freely. But when the sun has set, and the atmosphere has become cold and moist, the poison-vapours get entangled in the moisture, and float with it along the ground until they are dense and strong enough to be discovered by the nose.

But I have now something more to tell you, concerning the use of pure water, which, probably, will surprise you very much.

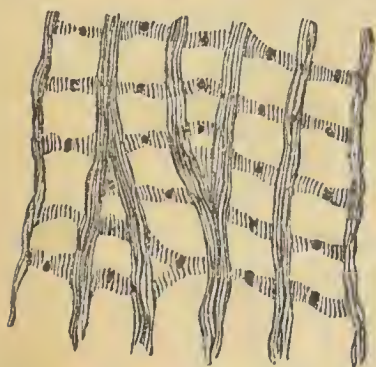
The house which is built of mortar and bricks and of tiles and boards, is not the only house that you

are expected to keep in order and wash out; that house is, after all, merely an outer case added to what is more properly, *your dwelling*.

Look at that body which is made up so wonderfully of flesh and bones, and which has such mysterious powers of moving and feeling; *that*, after all, is really your dwelling. It is in that body that you live, with high duties to perform, and high privileges to enjoy.

But the Great Landlord who has provided for you this comfortable dwelling, very naturally expects also that at least you shall keep it clean, so long as you occupy it; and in order that you may have no shadow of an excuse left you to do otherwise, he has furnished it with a very convenient series of outlets through which waste matters may be poured away.

The outside of your body is covered evenly over, with a soft, shining coat, which is called *the skin*. This skin looks to the eye as if it were a continued, unbroken covering, but it is not so, it is really full of little holes.

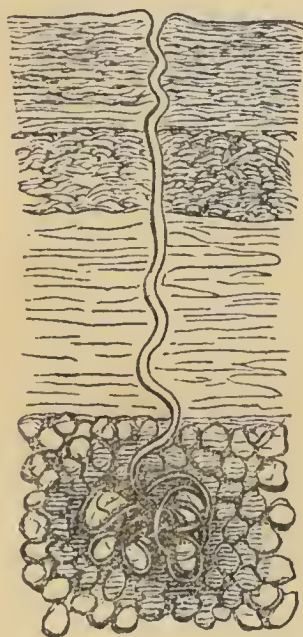


Suppose that I were to show you a small patch of this skin with a strong magnifying glass, you would see very much what is represented in this drawing.

You would find that it is marked with ridges and furrows, and that upon the ridges, round holes are dotted along in lines; these holes are so small that in some places as many as

three thousand of them are packed together upon a space not larger than the surface of a shilling, although separated from each other in the proportion represented in the drawing.

Now suppose, again, that I were to cut down into a piece of skin to see where these holes led to, what do you think we should discover? Why, that they led into little pipes which dip in through the skin, and are then rolled up into knotted balls. Each hole, in fact, is merely the opening or mouth of a pipe. In the drawing beneath, a greatly magnified plan is presented, of one of these pipes. It is observed beginning by the open mouth above, winding like a cork screw, downwards, through the substance of the skin, and then rolling up on itself, in the midst of the loose fat beneath.



Now how many of these little open-mouthed tubes do you think you have in the skin of your body? Should you wonder to hear that you have as many as there are hours in a long year? Oh! you have many more than that; it would take you six long years to count them, if you reckoned one every minute. You have three millions of holes in your skin!

But, again, how far do you think the three millions of tubes, running in from these holes,

would reach, if they were all joined together and stretched out in a line? Positively not less than twenty-eight miles!

You will readily admit that three millions of holes and twenty-eight miles of pipes, are not likely to have been placed in the skin of a single body, without a purpose; what purpose, then do they serve? Why, they are DRAINS AND SEWERS WHICH THE GREAT BUILDER, WHO MADE THIS HOUSE FOR YOU TO DWELL IN, HAS FURNISHED for carrying waste matter away from it.

So long as the body is in a healthy state, water pours out freely through these holes in the skin. This water is not generally seen, because it flies off into the air, as steam. But there is a large quantity of it; never less than one pint is poured out during twenty-four hours, and often as much as four pints.

But the water which pours out of the body through the holes in the skin, is not pure water; it is dirty water, containing a great deal of decaying and poisonous waste matter. As water passes through the living body, it washes out all the hollows and chambers it runs through, and cleanses them, carrying away useless and offensive substances.

The dirty water that pours out through the holes in the skin, is called *perspiration*, or *sweat*. The greater part of the bulk of this perspiration, is water; but not less than a quarter of an ounce of decaying solid substance is mingled with the quantity that flows away in twenty-four hours. As decaying substance is poisonous, it

therefore follows that *a quarter of an ounce of poison is drained away* from the body through the sewers of the skin, every day.

But with a skin thus formed, suppose you go on eating and drinking and working, day after day, and take no care of these pipes and holes, what do you think will happen? Why the same thing that would take place with house-drains under the same circumstances. The little pipes will get choked up, and poisonous matter will collect more and more inside of the body, until fever and derangement will be caused by its presence in the blood.

It is only the water of the perspiration that can fly off into the air, as steam; the thicker decaying substance that was mingled with it, is left behind on the surface of the skin, and is there mixed up with all sorts of dust and dirt that fall on it, until a kind of *filthy varnish* is formed, which chokes up and closes all the little sewers.

How then should you get rid of this dirty varnish, and open the mouths of these sewers, so that they may go on properly, pouring out their waste substance? Clearly by *washing the skin* well with pure water, at frequent intervals.

DIRTY SKINS HELP FOUL AIR IN ITS MISCHIEVOUS WORK. They keep poisonous matter inside of the body, and in the blood, which needs, for the health's sake, to be constantly got rid of. CLEAN SKINS HELP FRESH AIR IN ITS HEALTH-PRESERVING WORK.

The entire body, from head to foot, *needs* to be

carefully washed with pure water, at least twice in the week. It is far *better that it should be so washed once every day*, and the best time for doing this is on first getting out of bed in the morning.

You tell me that you have a great deal to do, and that you cannot afford the time which this would require. My answer to you is, that you can better afford that time than you can the loss, which want of cleanliness is very likely to bring. It would take you about five minutes at the outside, to wash yourself thoroughly every morning. Now how many such five minutes are there in every day? Not less than 288! Is it not worth while to take one of those 288 from sleep, or from any other occupation, to make sure that the three million outlets God placed in your skin to afford an escape for poison out of your blood, are open and clear, and performing their beneficial work?

The most pleasant and ready way in which the daily washing of the body can be performed, is to sit in a sort of tub, containing half a pailful of cold water, and to splash this over the skin by means of a piece of sponge, or a piece of flannel, rubbing the surface well all over, and afterwards drying it quickly with a coarse towel.

A BATH OF COLD WATER IN THE MORNING, DIRECTLY ON GETTING OUT OF BED, IS REFRESHING AND STRENGTHENING, BESIDES BEING ESSENTIAL TO CLEANLINESS. It brings a warm glow to the skin, encouraging the free flow of blood through its vessels, and guards against the risk of taking cold from accidental

exposure during the day. Even in the coldest weather of winter time, people feel much warmer when they wash all over with cold water before they dress, than they do when they huddle their clothes on as fast as they can upon an unwashed skin. No one who has once tried the plan of washing thoroughly every morning, will ever again desert it. He will go on with it if it be only for the pleasure and delight that he finds in the practice.

But you say, you do not think you can manage to get a tub that you could use for this purpose: that I doubt very much. In these matters I am quite sure that WHERE THERE IS A WILL THERE IS A WAY. I believe that all you need is to be made aware of how important the thing is, and that then you will certainly find a way to do it. But even if it be true that in consequence of some peculiar difficulties in your position, you cannot manage the bathing upon this agreeable plan; you may then, nevertheless, accomplish all that cleanliness actually requires by the help of a couple of old towels, and a couple of pints of water. The skin may be first thoroughly washed with the wet towel, and afterwards be rubbed with the dry one. At any rate, this you must quite understand,—there is no possible escape from the necessity. Nature has ordained that certain things shall be done, and what nature has ordained, must be accomplished, or the penalty of folly and disobedience must be paid. HE WHO CHOOSES DIRT AND LAZINESS IN PREFERENCE TO CLEANLINESS AND WELL-ORDERED EXERTION, MUST

TAKE DISEASE AND MISERY, AND POSSIBLY EVEN DEATH TOO, INTO THE BARGAIN. Never forget that the slight self-denial which refrains from purchasing a few pints of unnecessary beer, is amply sufficient for providing such a necessary and luxury as a morning bath of pure water, for the rest of a long life.

Some portion of the impurities of the perspiration is soaked up into the linen that is worn next the skin. If the same linen be worn day after day, these impurities gather in the linen more and more: this is why linen becomes very dirty by constantly wearing it without change. It is of very little use that the skin is duly washed, if it be wrapped round directly afterwards with a fabric whose pores are entirely filled with refuse matter, like that which has just been cleansed away from its surface. IT IS ABSOLUTELY NECESSARY TO HEALTH THAT THE LINEN SHOULD BE CHANGED AND WASHED EVERY FEW DAYS.

When the body is covered up closely at night, by the bed-clothes, the perspiration flows more freely from the warm skin. A portion of this is soaked into the linen worn immediately round the body, but another portion steams into the sheets and blankets. Hence these too require to be sometimes changed and washed. Dirty bed-clothes, like dirty body-linen, keep the body closely wrapped in poison which it was meant it should be freed from. It is a very excellent proceeding always to fold back neatly all the bed-clothes off the bed, upon getting up in the morning, and TO LEAVE BOTH THE CLOTHES AND THE BED

EXPOSED two or three hours with the window of the chamber wide open, so that the fresh wind may blow in freely and disperse any poison-vapours that are lurking about the fibres and in the pores of the clothes. On dry sunny days the BEDS SHOULD BE TAKEN OUT INTO THE OPEN GARDEN OR YARD, if there be one that can be used for the purpose, and should be laid in the bright sun and fresh air, to purify.

Remember, then, that fresh air and pure water are twin sisters, sent down upon earth to work in close compact for human good. Upon the hill-side, in the green valley, and upon the broad plain, they run together in intimate companionship. Beware how you either sever them, or banish them altogether from your dwelling. Only in barren deserts and in deadly fever-haunts, are they ever divided or absent. If you would not have your home a barren desert or a fever-haunt, take care that you find there a warm welcome and good entertainment for this bountiful and gracious pair.

THE VALUE
OF
GOOD FOOD.

THE VALUE OF GOOD FOOD.

It so happens that one of my friends has a powerful steam-engine, which he keeps employed in spinning wool into yarn. It is a great enjoyment to me to stand and watch that iron giant performing his ingenious work. I delight to see his massive arms swinging up and down with mighty strength, and his huge wheels and heavy shafts rolling round with resistless power. In one place he may be contemplated washing bales of wool with his iron hands, and picking them into shreds. In another, vast revolving drums collect the cleansed shreds, and press them dry. Then steel fingers draw them through fine-toothed combs, and distribute them into threads, which are next pulled out more and more slenderly between quickly-turning rollers. Lastly, the threads are delicately twisted and wound upon ten thousand spindles. The giant strength of the great central shaft is thus expended upon a countless multitude of pigmy, spider-like efforts. Each of those spindles turns with a force such as an infant's finger could communicate. But the thousands of softly-twirling spindles require, nevertheless, the might of a hundred horses to keep them all at their work.

Where do you think that yarn-spinning giant gets all his wonderful hundred-horse power? Whence do you suppose he derives the strength, which can make those iron hands and steel fingers continually clutch at the wool-bales, and those ten thousand spindles turn unceasingly from morning till night? You will say he gets it *from steam*; he is a steam-giant, and his iron limbs are driven by hot vapour.

But he makes his own steam, so that answer will not do. We must go farther than the steam to find the origin of his power. I will tell you where his strength comes from—IT COMES OUT OF FOOD. If you want that big fellow to work, you must feed him. Stop his food, and he will not do another stroke of labour. Give him nothing to eat, and his mighty arms will leave off their swinging, and his supple joints will grow motionless and stiff.

And what is the food that the steam-engine consumes? If we were to go round outside the engine-room of the yarn-spinning giant, we should see for ourselves what it is. Every now and then we should observe a huge mouth opened wide, and fresh supplies of nourishment shovelled into it by a sturdy attendant, and we should hear the giant roar hoarsely with satisfaction, as he swallowed morsel after morsel. The steam-engine eats black coal, and out of black coal gets its power.

Now, as it is with that yarn-spinning giant, so it is also with your own living frame, my working friend. It matters not what your work is—whether you dig and plough in the fields, or hammer upon the anvil, or weave in the loom. THE STRENGTH WITH WHICH YOU PERFORM YOUR LABOUR, COMES OUT OF THE FOOD YOU EAT; and if you are not duly fed, *your* limbs too will soon refuse to play, and *your* joints will become rigid and still.

But your living frame, considered simply as a machine,—that is, as a complicated instrument, capable of performing labour when set to work,—is very much more wonderful even than the machinery of that surprising steam-giant. You can accomplish many many times more work than he could upon the same amount of food. Suppose that he were taken off from his usual yarn-spinning occupation, and were set to lift heavy weights instead. How much food do you think we should have to supply to him, if we wanted to get him to lift a block of stone, weigh-

ing one ton, up to the height of a mile? We should have to give him 890 *pounds* of coal before we could make him finish his task. That then is what his labour would cost us. We should have to buy 890 pounds of coal for him, for every ton he lifted one mile high for us. You, however, would be capable of making as great an effort, if you were allowed only *two pounds* of food. A strong man can carry a weight of 85 pounds along a level road for seven hours at a stretch, if he does not walk more than a mile and three-quarters in an hour. But in doing this he will, of course, have to carry his own body along too. Now if his body weighed 140 pounds, and he carried the additional weight of 85 pounds upon his shoulders for this distance, and at this pace, he would actually make as much muscular effort in the time as would have been sufficient, if entirely applied to the work, to lift a ton a mile high. Powerful as the steam-engine therefore is, the human body, viewed only as a machine, is 445 times more so. In this degree nature excels art, or rather, the work of the Divine Hand is more perfect than that of human ingenuity. Give a steam-engine only the same weight of food as a living man, and it will not effect so much work by 445 times. It is true that steam-engines perform tasks which it would need *hundreds* of men to accomplish, but they only accomplish this by swallowing up *thousands upon thousands* of times as much food, as the men would, who did the same thing. My friend's hundred-horse power yarn-spinning giant has to be fed with three tons of coal every day.

But there is another remarkable difference between steam-machinery and flesh-and-blood machinery. The food of the steam-engine sets its parts moving, but has no power to keep those parts in repair. All the while those iron shafts and rods and wheels are at work, they go on rubbing and wearing themselves away. After a few months' labour those hard pieces

of metal will be quite worn up by their own movements, and a new steam-engine will have to be built to take the place of the old one. My friend knows very well that his mighty steam-engine is rubbing itself away, and that what is now worth several hundred pounds, will, by and by, come to be of no more value than old iron. He knows too that the more food he gives his steam-engine, and the more work he gets out of it, the sooner it will be worn away. Not so, however, with your body. The food you take, repairs its wear and tear, besides keeping it at work. The bread and meat which you eat, first get changed into the substance of your body; actually become flesh and blood; then as flesh and blood, they perform a certain amount of useful labour. Like the iron of the steam-engine, they are worn away by their work; but that is not of very great consequence, because fresh food will make fresh flesh and blood, capable of doing fresh work. You therefore are fed, not only that you may be able to work, but also that you may be kept in repair while you are working, at least during some three-score years and ten.

The food first renews the worn body, and then it is the renewed body which is worn again by work, yet again to be renewed. How admirable is this superiority of the divinely planned mechanism, to the conception of man!

There is something however, which coal does for the steam-engine, besides setting it to work—it makes it warm. Soon after the fire has been lit in the furnace, the iron gets furiously hot, and the water in the boiler turns into scalding steam; all this heat really comes out of the coal. It was hidden away in the black mass, and only required that to be placed in the furnace, to be set light to, and to be blown upon by a draught of air, in order that it might be brought out, and made serviceable. One

pound of coal has heat enough hidden away in it, to boil 60 pints of water.

But your body too is warm. And where do you think it gets its heat from? Starve yourself for a day or two, and you will find this out. You will, under such circumstances, feel colder and colder, as well as getting weaker and weaker. A good nourishing meal on the other hand, will directly make you glow with warmth. **FOOD WARMS THE BODY**, as well as furnishes it with strength. There is as much heat produced in your body in a single year, as would be sufficient to turn eleven tons of ice into steam; as much in a single day, as would boil eighty pints of water.

Food then does three distinct things for the living body, and the living body must be duly fed at proper intervals, in order that these three distinct services may be rendered. **IT KEEPS THE BODY WARM. IT MAINTAINS IT IN A STATE OF REPAIR**, notwithstanding the wear and tear to which it is exposed while labouring. **AND IT GIVES IT STRENGTH AND POWER.** Weigh out two pounds of bread and meat, and look at them. The two pounds make no very great shew. But eat them, and in the wonderful contrivances of your body, those two pounds of bread and meat will sustain its machinery unwasted during the exertion of a fair day's work, and in addition to this will supply heat enough to make 80 pints of water boil, and strength enough to lift a ton weight one mile!

In order that food may accomplish these important services, it is necessary that it shall be wisely chosen and no less wisely used. Many men get wasting disease, and death out of food, in the place of nourishment, warmth, and vigour. If we were to heap up wet sand in the furnace of the steam-engine, instead of coal, the fire would be smothered, and the movement of the machinery stopped. If we were to heap up gunpowder there, the whole would be blown into

fragments in a moment. Or so again, the fire of the furnace might be extinguished by smothering it with too great an abundance of coal, or it might be allowed to smoulder and die out for want. Exactly in the same way the fire and strength of the living body may be smothered by a too heavy load, or by a bad kind of food. Or it may be fanned into the explosion of destructive inflammation and fever. It is important therefore, that every one should know what right food is, and how good food requires to be managed. When I go down to see my friend's yarn-spinning steam-engine, I find that a very great amount of care is bestowed upon its feeding. Only the most suitable coal is supplied for its consumption, and the stoker, who feeds it, is selected from among his companion workmen for his judgment, and he is trained to be exceedingly careful, watching its wants, and studying its appetite, so as to give exactly what it can manage, a little and often, never allowing the furnace to be either too hungry or too much gorged.

My friend is ten times more particular about the feeding of his steam-engine, than he is about the feeding of himself, and in this respect he is pretty much like the rest of mankind. Men select and regulate, with the most cautious deliberation, what they put into the iron furnaces of their machinery; but into those delicate and sensible living furnaces which they carry about in their own bodies, they toss with reckless indifference, now, as it were, lumps of lead, and now explosive gunpowder. There is, indeed, sad need that men should be made more thoughtful than they are about feeding their bodies. As a guardian and supporter of the health, GOOD FOOD STANDS CLOSE BY THE SIDE OF FRESH AIR AND PURE WATER. Bad feeding, on the other hand, is the ally of foul air and deficiency of water, in working out dire disorder. Improper management in feeding, then, is another way in which men lay up for themselves

disease and suffering, and cause sickness to take the place of health.

Man's food consists of an almost endless variety of substances. The surface of the earth is covered with things which man can eat, and get strength out of. This is a very bountiful arrangement, made by Divine Providence, in order that the rapidly increasing multitudes of the human race may be supported. Into whatever diversity of climate or country man can go, there he finds a rich abundance of the nourishment which the continued well-being of his body requires. In the hot tropics he gathers bread-fruit from the trees, and plucks rice from the ground. In temperate lands he covers the soil with corn, and pastures beef-yielding oxen and mutton-affording sheep upon the grass. In the frozen wastes that lie near the poles, he gets whale-blubber and seal-oil from the inhabitants of the ocean. The water teems every where with fish, the air with fowl, and the solid ground is literally painted green with its productiveness. Nearly all food-substances are, however, more or less solid bodies, in order that they may be kept conveniently in store until they are immediately needed, and it is, therefore, a natural consequence of this arrangement that they have to undergo a sort of preparation before they can be put to use. The several parts of the body which have to be nourished are far more delicate than the finest hairs. Now suppose that you were set to get beef and bread into hairs, I fancy you would find yourself rather puzzled by the task. God however is not so puzzled. He pours beef and bread into fibres that are as much smaller than hairs, as hairs themselves are smaller than men six feet high and three feet round. You will be glad, no doubt, to understand how this is done.

The All-wise and Almighty Designer of life has seen fit to employ in the work an agent that is already familiar to us. This agent is that pure

water, which we have been recently contemplating, busy in its employment of carrying waste matters out of the way. God WASHES FOOD INTO THE BODY, exactly as He *washes* worn-up material out of it. The very water, indeed, which carries away the waste, has first economically carried in the food. God has laid down pipes of supply which run every where through the structures of the body, exactly as he has laid down drain-pipes. These pipes branch out to the hair, the eyes, the head, the feet, the flesh, the bones, and the skin. At the beginning of the supply-pipes there is a great pump always at work, pumping on the supply. This pump is called *the heart*. Place your hand on the left side of your chest, and you will feel how this heart is springing at its pumping work. You will be sensible that it is raising itself up at its labour, at every stroke, so determined is the exertion of its strength. The supply-pipes are termed *arteries*. One large arterial pipe comes out from the heart, and then sends out branches in all directions, very much like the water-pipe sent out from the great reservoir into all the houses of a town. The branch-pipes get smaller and smaller as they go from the main, until at last they are many times smaller than the smallest hair. The food that is washed through the branching supply-pipes, by the strokes of the heart, is called *blood*. There are about 20 pounds of blood in the body of a full-grown active man; of these 20 pounds nearly 16 are nothing else than pure water, the other 4 pounds are the finely divided food which is being hurried along by the water. This then is what I mean when I say that the food is *washed* into the body, by the agency of water. Take the finest needle you can find, and stick its point any where into your body, and you will find that blood will rush out of the hole. This will show you what great care has been taken to send supply-pipes *every where*. There is no spot, however small, into which a needle point can be

thrust without wounding a supply-pipe. When the heart pumps, red blood thus *flushes through* every portion of the living frame, repairing and warming it, and supporting it in its offices. But you will say I have not yet proved my case. Food is washed out of the heart to all parts of the body. This heart, however, is already *in* the body. There is therefore no washing of the food *into the body* here. It is already in, when it is pumped from the heart; but where does the heart get the blood from, which it pumps onwards? How can it be shown that the blood comes out of food? This is to be my next step. I am going on to explain to you that the heart gets its blood from the food which is eaten; that the blood indeed is finely divided food given up to the conveying power of water; food finally prepared for its task of nourishing the living frame. How then is the food thus prepared? how is solid food turned into liquid and easily flowing blood?

FOOD IS TURNED INTO BLOOD BY BEING DIGESTED. Men have digesting bags, more commonly known under the designation of stomachs, inside of them, into which portions of digestible substances are placed from time to time. These inside digesting bags are particularly convenient, because when a fair quantity of food is once packed away there, men may move about in pursuit of their business without having to give any further heed to the digesting work that is going on in their behoof. Before, however, food is passed down into the digesting bag, it is first ground in a powerful mill, and mixed up with liquid into a sort of paste. The mill has many pairs of very hard stones set in rows over against each other. It is called *the mouth*, and the stones are termed *teeth*. The liquid which makes the ground food into paste, is poured out from little taps laid on in the mill or mouth, and is called *the saliva*.

When the ground and moistened food has been deposited in the stomach, more liquid is poured out upon it there. This liquid is termed the "gastric" or *stomach juice*. Next it is shaken, and churned up, and turned over by the movements of the stomach-bag. After a few hours' churning, it has become so soft and pulpy from the soaking, that it is ready to advance another stage. Then a sort of sluice-gate at the end of the stomach is opened, and down the pulp goes into the bowel, there to be mixed with another liquid called *bile* or *liver juice*, and the soaking or digestion is completed. The pulp then consists of two things—a white milk-like liquid; *that* is the rich and nourishing part of the food, ground and soaked down to the utmost fineness, and mingled with some of the water which has been drunk. And a coarse solid substance, still undigested; *that* is the waste part of the food which has resisted the dissolving power of the stomach, and is on its way to be rejected as good for nothing. The white milk-like essence of the food gets sucked up, by a quantity of little holes or mouths that lie all over the lining of the bowel, as the pulp moves down this canal. Then it is carried by tubes provided for the purpose into one main channel. This channel runs upwards until it ends in the great forcing pump. Poured into the heart, it reinforces the blood which it finds there, and is sent onwards with it through the supply-pipes. This is how food becomes blood.

Very wonderful, indeed, is this dissolving power of the saliva and stomach juice! If the food were merely beaten with water into a moist pulp, and were then left in a warm place, it would soon ferment, and become putrid, and good for nothing. The digesting juices, on the other hand, so long as the stomach is healthy and strong, keep the moist pulpy food sweet in the warm stomach, and merely draw out from it a rich milky essence of nourishment, which consists, indeed, of the very strength of the food. The saliva mixes with the ground food much more readily than

pure water could, but itself has a very great affection for water, so to speak. It thus brings the ground food under the full dominion of water. The saliva, the stomach-juice, and the bile, together, are able to draw out and change into milk-essence every nutritive particle that is contained in the food, however diversified this may be. Each has its own method of operating, and each takes its own share of the dissolving labour; but the result is, that all which is needed for the service of the body is taken out from the food, and made ready to be washed along into the blood.

But there are CERTAIN DISTINCT AND DIFFERENT PRINCIPLES which the body requires should be furnished to it, out of food. You stand there very firmly on the ground, and you look jolly and substantial enough. I should think from your appearance you have been in no way stinted in the matter of supplies. I estimate, at a guess, that your substantial body would weigh, some 150 pounds, if placed in the scales. Now what do you think the *greater part* of those 150 pounds is composed of.—Bones? Not exactly, you are too soft for that.—Flesh? There seems plenty of flesh, but the flesh is not the most abundant element.—Brains? I am afraid they are less than the flesh. No. You will wonder indeed when I tell you that three-quarters of that firm and well-knit frame, are nothing else but WATER. If I were to take your body and dry it until all its water was gone, there would remain behind nothing but 37 pounds of dry mummy-substance, in the place of the original 150 pounds; 113 pounds of water would have steamed away. You will see then that water must be furnished in fair quantity, with or in the food. You have heard, I do not doubt, many horrible and sad things, which have happened when people have been kept a long time without water. Thanks to the bounty of Providence, this privation is, however, one that very rarely occurs.

But now, supposing that we have steamed away

the 113 pounds of water, and that there are left behind 37 pounds of dry substance, what does that substance consist of? It still contains several distinct things, which have had entirely distinct offices to perform in the living frame.

First, you know, there is that **FLESH**, which makes so comely a show. *Now*, we shall be able to find out, how much there really is of flesh. Of dry flesh-substance, including a little skin and jelly, there are 17 pounds, and that is the working part of the frame. It is by its means the ton-weight can be lifted one mile high in a single day, and that all the moving and acting, of whatever kind, are effected. Remember, then, that the acting part of the living body is *flesh-substance*, and that of that flesh-substance there are not more than 17 pounds in a full-grown man.

While your body is alive, there is a hard frame-work inside of it, upon which the soft flesh is fixed, in order that it may be kept in a convenient and durable form, and around which the water is packed in a countless myriad of chambers, and vessels, and porous fibres. The hard internal frame-work is composed of what are called *bones*. In the dried mummy, left when the moisture is all gone from the body, there are rather more than nine pounds of this mineral bone-substance. But there are also nearly three-quarters of a pound of other **MINERAL SUBSTANCES**, which were scattered about in various situations, and which were employed for various purposes. There is salt which was in the saliva, in the gristle, and in the blood. There is flint which was in the hair. There is iron which was in the blood. There is potash which was mixed with the flesh-substance. There are lime and phosphorus in the hard millstones,—the teeth; and there is phosphorus, which was in the nerves and the brain. These mineral substances with the bone-earth, which is principally a kind of lime, form together the ash or dust which is returned to the ground after the body has decayed. It is the flesh-substance which

flies away to become poison-vapour in the air. (*See p. 13, 2nd ed. of "Worth of Fresh Air."*)

But besides water to do transporting work, flesh-substance to do active mechanical or moving work, and mineral substance to do passive mechanical or supporting work, there is yet another kind of material within the body. You have as much as six pounds of FAT, scattered about or packed away amid the 17 pounds of dry flesh.—What can that be for? What use do you think you make of your fat? You have, I dare say, a sort of comfortable sense that it keeps you warm. You know that some of your lean neighbours cast envious eyes towards you in severe winter weather, and have chattering teeth and goose's skins, when you are quite free from such tokens of chilliness. But you will nevertheless be surprised when I tell you what a really fiery piece of business this warming by fat is. Your fat is a store of fuel, which you are going to burn to heat your body, exactly as you burn coal in the grate to heat your room in the winter. It is oil laid by, to be consumed gradually, as a sort of liquid coal, in the furnace of the living machine. Of this we shall, however, have to say more, by itself, by and by. For the present merely bear in mind that fat is the fuel-substance which furnishes warmth to the body. It also combines with the phosphorus and with water to make up the *nerve-substance* and the *brain-substance*, which do the feeling and thinking work. These too, however, will have to be spoken of hereafter by themselves.

Let us now then take stock of the stores we have on hand, within the skin of a living body of 150 pounds weight. We have

WATER for transport and moistening,	113	pounds
FLESH-SUBSTANCE for movement .	17	„
MINERAL-SUBSTANCE for support .	10	„
FUEL-SUBSTANCE for warming .	6	„

If we add these together, our sum is 146 „

We still want four pounds more to make up our 150. Where are we to get these? Why we have got them already. Have we not already learned that there are four pounds of freshly digested food being washed along through the supply-pipes of the body?

We have only to add to the previous 146 pounds

Dry substance of THE BLOOD	.	4	„
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and our tally is completed to 150 „

As the blood is the direct source of supply to all the structures of the body, the material which is being poured out through the supply-pipes,—it follows that those four pounds must contain within themselves flesh-substance, mineral ash, and fuel. There are in 20 pounds of blood, 16 pounds of water to wash along the more substantial part through the supply-pipes, three pounds ten ounces of flesh-substance, four ounces of fuel, and about 2 ounces of mineral matter; salt, phosphorus, lime, and the rest.

The blood is speedily exhausted of its richness, because it gives up its several ingredients to the different parts of the living frame to confer warmth, repair, and active strength upon them. The warmth is procured by burning the fat; you will easily understand that; you know that an oil lamp gets very hot whilst its flame is kept up. The repair is effected by the plastering of new matter out of the blood, upon all the different structures as they wear away. Each structure selects for itself out of the blood what it wants, and arranges what it takes in due order. But you would now like to know how active strength is supplied by the blood. It will not be possible *just now* to tell you concerning this, all which might be, and indeed ought to be told, because we have other and more practical things to bend our attention to. But this much you will easily comprehend. The power COMES OUT OF THAT VERY CHANGE of substance, which we call wear. The “wear” is actually the turning of

the substance into power. Upon another occasion this may be made more plain.

The blood supplies what every part of the living body requires, and of course itself loses what it gives out. But the impoverished blood is in its turn renewed and refreshed by occasional supplies of food. Here then we at last arrive at the pith of the subject under consideration. The food supplies the blood, and the blood supplies the body. Therefore EFFICIENT AND GOOD FOOD MUST HAVE IN IT ALL THE SEVERAL PRINCIPLES REQUIRED BY THE BODY—FLESH, FUEL, AND MINERAL. No kind of food is sufficient to maintain vigorous life and health, which does not contain a due amount of every one of these.

When the young animal comes first into the world, its powers of digestion are weak, and it is fed for some time entirely upon a food already digested for it by the parent. This parent-prepared food of the young animal, which is called MILK, of course, contains within itself all the several matters which have been spoken of above, as essential for the supply of the body. Thus when the dairy-maid curdles milk with rennet, and draws off the whey, afterwards pressing and drying the curdled part, the curd at length comes out of the press as *cheese*. That is the flesh-substance, which was contained in the milk. When the dairy-maid turns and twists cream about in the churn, until *butter* collects in the midst of it—that butter is the fuel-substance, or fat, which was contained in the milk. The whey which is taken off from the cheese, or butter, is principally *water*; but if this water were steamed away by heat, there would remain behind a small quantity of *fixed ash*, which could not escape.—That is the mineral-substance. Here then we have what we may term a specimen of Nature's pattern-food. The relative proportion in which the several food-principles are contained in milk, becomes a most excellent guide to the way in which they should be

used in the more artificial feeding of later life. Take then as

A Receipt for Pattern Food,

the following, which expresses the relative quantities of cheese, butter, and ash, in milk.

One ounce of Flesh-substance,
Two ounces of Fuel-substance, and
Ninety grains of Mineral-substance,
To twenty-two ounces of Water.

The most extensively and generally used of all the articles of human diet is **Bread**. It has been fittingly called **THE STAFF OF LIFE**. Now it is a curious and remarkable fact that bread contains in itself just the same principles as milk; but it is of course drier, and has proportionally more fuel and less flesh-making substance. The flour, from which it is made, is composed of a stiff sticky *paste*, and a fine white *powder*, well mixed up together. The paste is *flesh-substance*; it is nearly the same thing, indeed, as the flesh of the body, in all excepting arrangement. The powder is *starch*: just such as is used in the work of the laundry. Now starch is merely fat in its first stage of preparation. It is vegetable fat in so firm and dense a condition that it can be stored away in the husks of grain, or even in bags made by man, and kept there unspoiled until it is wanted. When starch is about to be used as fuel in the living frame, it is first turned into *sugar* and *gum*, and then into perfected fat, or oil. Sugar and gum are starch in the process of turning to fat. They are the store-fuel making ready for burning. Even seeds, when they begin to grow, become sweet, because their starch is then converted into sugar. Remember carefully then, that *starch*, *gum*, and *sugar*, are all *fuel-substance*, in different stages of preparation for burning.

Now if you were going **TO MAKE FLOUR INTO BREAD**, how would you proceed? First you would place seven pounds, we will say, of flour in a pan. You would

hollow out a hole in the middle, and pour in half a quarter of a pint of yeast, mixed up with a pint of warm water. You would stir this up with a wooden spoon, until it formed a thickish paste. The paste is the sticky flesh-substance of the flour, moistened with water, and holding the starch fast in its grasp. After the mixture has stood an hour and a quarter in a warm place, you would next add two teaspoonfuls of salt, and knead the whole well up together with as much more warm water as is sufficient to make the compound into a stiffish dough. If you intended to make good bread, you would spare no labour in this part of the process. You would knead it, and work it, and knead it again, until your arms and hands ached with the work. You would do this in order that the yeast and the water might be forced into contact with every portion of the dough. If any were left insufficiently moistened, and unyeasted, that portion would not be changed into good bread. Having finished the kneading, you would leave the dough standing another hour and a half, covered lightly over by a cloth. During this time it would rise, its inside becoming more and more spongy. The reason of this is, that the yeast, moisture, and warmth, have made some of the starch turn into sugar and gum; and as it has been doing so, a sort of fixed air has burst out from the starch, and forced the sticky paste into bubbles. After the hour and a half of standing, you would cut the dough into two or three pieces, and you would place these upon a tin in a well-heated oven, having its door thoroughly closed, and bake them for an hour and forty minutes. The heat of the oven would then soon destroy the activity of the yeast, and fix the dough, so that it could not froth and bubble any longer. In due time you would draw forth the dough from the oven, and find it baked into loaves.

When bread is well made, by the skilful employment of these measures, *the rising of the dough* marks the change of the store-starch into sugar and gum through

fermentation. This is really *a beginning of the work of digestion*, and, in so far, a lightening of the task the stomach will have to perform. It is very important, however, that this change shall be carried to a proper point, and then stopped. Bread should be neither *too heavy* nor *too light*. If the former, it will not be easy enough of digestion; if the latter, some portion of the virtue will have been unnecessarily wasted. Bread contains a great deal of water, and so to a certain extent is both food and drink. One hundred pounds of flour suck in 50 pounds of water, when made into dough. This is all retained in the bread, however dry it may seem to get. If stale bread be heated for half an hour in a *close* tin case, nearly to the temperature of boiling water, and then be taken out, it will be found to be restored to the condition of new bread. In wheaten bread, to every 11 ounces of water, there are 12 ounces of mingled starch, sugar, and gum, and one ounce of flesh-substance.

Brown Bread is more rich in flesh-making substance, bulk for bulk, than fine wheaten bread, because the outer husk of the grain, which constitutes the bran, itself contains a large quantity of that material. When the dough is formed from *whole meal*, instead of from fine flour, the cost of the bread is considerably diminished, at the same time that its bulk and weight are, even in a greater degree, increased. The addition of a little milk to the dough has the effect of still further raising the nourishing power of the bread, besides causing it to keep fresh longer; a pint of milk adds one pound to the weight of a loaf. A quarter of a pound of mashed potatoes, mixed in with every four pounds of flour or meal, also improves the keeping quality.

Rye-bread is not so pleasant in flavour as wheaten bread, but it is about equal to it in nourishment, and can be kept for months without being spoiled, which wheaten bread cannot. **Oatmeal** cannot be fermented like wheaten meal, but it is

nearly as rich again in flesh-making substance. It is its very richness in this gluey material, which renders it incapable of being made into light bread. Scotch men and women consume a great quantity of oatmeal as porridge and unfermented cake, and get both very fat and strong upon their food. This article of diet, has indeed, the recommendation of being very appropriate for young people, who are growing rapidly, and is fortunately, at the same time, *comparatively* cheap.

Milk, the pattern food, contains, it will be remembered, twice as much fuel as flesh-substance in it. But *bread* contains eight times as much fuel as flesh-making substance. Consequently a great deal more bread has to be consumed to get the same amount of nourishment out of it, and then very much more fuel has been taken into the frame than is required, which has to be got rid of as waste. Hence it is both economical and wise to add to a bread-diet, whenever this can be done, some other kind of food, which consists principally of flesh-substance. *Butter* and *fat* are also advantageously taken with it, because the fuel contained within bread is a great deal of it still only store-fuel, and unfit to undergo immediate burning.

The best addition that can be made to bread-diet is obviously that flesh-substance which is already in a very perfect and condensed state—namely, **Meat**. *Lean beef* contains four times as much flesh-substance, weight for weight, as the most nutritious bread, and it is entirely destitute of the store-fuel, starch, of which bread has such a superabundance. Meat therefore is manifestly the natural ally of bread in the formation of a very nutritious diet. All wild animals have very little fat mixed with their flesh. It is, however, the great object of the grazing farmer to make his mutton and beef as fat as he can. Meat, as it is sent to market, commonly has one-third of its substance fat alone. Such meat approaches more

nearly to the nature of bread, and indeed may almost be used instead of it, so far as its influence on the support and warming of the frame is concerned.

It is even more important how MEAT IS COOKED, than it is how bread is made. A very great deal of waste and loss are easily produced by unskilful management in this particular. Meat is cooked to make it *easier of digestion*;—indeed by the process digestion is begun by art before the food is introduced into the stomach. A certain quantity of the meat is necessarily lost by cooking. A pound of beef, for instance, is reduced 4 ounces in boiling, and a pound of mutton $3\frac{1}{2}$ ounces. This loss is, however, in well-managed cooking, principally water and fat; with badly-managed cooking nearly all the nutritious part of the meat,—its flesh-substance,—*may be wasted* too.

A pound of meat loses an ounce more in baking, and an ounce and a half more in roasting, than in boiling. Boiling is therefore the most economical method of the three. Meat should always be *put first into boiling-hot water*, because by this means the pores of the surface are at once closed fast, and the juices shut in. When meat is placed in cold water, and kept gently simmering, the juices all ooze out into the water. The latter plan is the best mode of proceeding, when the object is to *make nutritious soup* or broth. But when it is desired to *keep the meat itself nutritious*, the employment of the greater heat at first is the more judicious course. So likewise in roasting, the meat should be *placed at once close before a clear fierce fire*, in order that by the curdling power of the heat a great coat may be formed upon it, through which the juices cannot flow; then it should be removed further away, in order that the inside may go on cooking more gradually by the heat of the imprisoned juices. When meat is placed before a dull slow fire at the first, the principal part of the gravy runs out, before the surface is hardened and closed.

Meat is the most valuable addition which can be made to bread, but unfortunately it is not a cheap addition. It requires a certain command of means always to be able to place a joint on the table, and this cannot be constantly reckoned upon by working men, who have families to provide for. Any kind of hard and inferior meat which may be purchased comparatively cheaply, as, for instance, an ox cheek or a sheep's head, may however be made to yield a richly nutritious and palatable meal. It should first be rubbed with a little salt and pepper, and then be put into a saucepan, with from one to four quarts of cold water, according to its size. This is then to be kept simmering upon the hob from one to three hours (according to size.) The fat being skimmed off will be serviceable for making puddings. A little celery or onion may be put in during the simmering. The meat will prove deliciously tender, and there will be in addition, from one to three quarts of excellent nutritious soup to be eaten with bread. Even bones, of which a fifth part is nutritious substance, may be made to furnish a meal for hungry stomachs, by this simple contrivance. Break small six pounds of bones, boil them in eight quarts of water for three hours, with three tablespoonfuls of salt and a bunch of thyme or other savoury herbs. Then skim off the fat and remove the bones. Put into another saucepan or pan, the fat, two sliced onions, a pound of carrots, turnips, or celery, and two teaspoonfuls of sugar. Set the whole on the fire, and stir for 15 minutes, add half a pound of oatmeal and mix this well in, next pour over the broth from the bones, add a pound of rice, and boil again until this is soft. By this management you may provide a very nutritious meal at a much lower cost, than a meal of bread.

THE GREAT OBJECT OF COOKING is the reduction of the several principles of the food into such a soluble state as will prepare them to be easily acted upon by the digestive powers of the stomach, at the same time

that none of their virtue is allowed to be lost. Cooking is, indeed, properly the first stage of digestion; it is an art which the intelligence of man has taught him, in order that food may be made to go as far as possible in furnishing nourishment to living frames. *By good cooking, hosts of things are converted into excellent nourishment*, which would be entirely unmanageable by the stomach without such assistance. The art of cookery ought, however, never to be carried further than this. It should not strive to make men eat more than their bodies want, by furnishing the temptation of delicious flavours. Every meal should have brought together into it, a due admixture of the several distinct principles, which have been named as the great requirements of the body; but there should be no greater degree of mixture, than is just sufficient to ensure this. There should be *flesh-substance* in a half-dissolving, or tender state. There should be a still larger amount of *fuel-substance*, partly fat, and partly such as is in a condition capable of being converted into fat in the stomach and blood. *Mineral substance* enough is sure to be present in every kind of food; and *water*, of course, can be added in any amount, as drink.

There are several common methods of intermingling different kinds of food, to form a meal, which seem to have been adopted almost unconsciously, but which nevertheless are right in principle. Thus MEAT and BUTTER, are, as we have seen, generally eaten with over-starched BREAD. RICE, and ARROWROOT are nearly pure starch, and are commonly mixed with MILK, and with MILK and EGGS, which are both rich in flesh-substance. WHITE OF EGG is entirely composed of flesh-substance and water; it is added to puddings to make them more gluey. Eggs are eaten with FAT BACON because the white is entirely destitute of fat. YOLK OF EGG consists of flesh-substance and oil. PORK is taken with PEAS and BEANS, because they possess a great abundance of

nutritious or flesh-making substance, while the pork itself has more fat and less nutrition than any other kind of meat.

The **Potatoe** contains twelve times as much starch as flesh-making substance; it is thus one-half less nutritious than bread. On this account it is very generally made the companion of meat. A very excellent nutritious dish may be formed by placing about two pounds of neck of mutton in a pan, with eight large potatoes and four onions sliced, a tea-spoonful and a half of pepper, three tea-spoonfuls of salt, and enough water to cover the whole; the pan is to be set in a slow oven for two hours, and its contents are to be all stirred up together when about to be served. When the potatoe is cooked, a portion of its store-starch is changed into sugar and gum; in this conditon it is very similar to bread which has lost a portion of its flesh-making substance. It requires some little attention and skill to prepare the potatoe properly for the table. New potatoes cook best when put first into water nearly boiling; old potatoes more generally when first put into cold water. They should be boiled in their skins, until these begin to crack, a little salt having been added to the water. The water extracts a soluble matter contained in the root, which is not altogether wholesome; it should therefore be now thrown off, and the potatoes be left for a time standing dry near the fire, covered with a cloth. The more waxy the potatoe, the more quick should be the boiling. Watery potatoes are also greatly improved if a piece of lime, about the size of a nut, be placed in the water. It serves to extract from the tubers some of the substance which keeps them in a waxy state.

It is of the very highest importance that any one who is likely ever to have the care of a household, whether large or small, should so far UNDERSTAND THE OBJECTS OF COOKING AND THE PRINCIPLES upon

which the process requires to be performed, as to be able to see that food is properly and economically prepared. If your means be small, remember that such knowledge can make that portion of your money which is devoted to the purchase of food, go as far again, and yield twice as much harmless gratification as it would otherwise do; if you have an abundance of means, then the knowledge may be made serviceable in providing *only* such food as is suitable to the maintenance of health and strength, and the avoidance of disease. If you have a family of children to bring up, and have plenty of money to do it with, you are perfectly right to furnish them with every accomplishment, and every advantage learning confers; but never forget that no woman is ever less accomplished because she knows something about homely household concerns,—cooking among them,—as well as a great deal concerning other things.

Fish very nearly resembles lean meat in its character; it is hence a very good companion to potatoes and bread. In a general way it requires to be eaten with butter or oil on account of its deficiency in this ingredient. *Skate* has 32 times as much flesh-substance in it, as fat. *Haddock* and *herring* have eleven times as much. The *salmon* and the *eel* are the only kinds of fish which are in themselves of a very oily nature. The salmon has a little more than three times as much flesh-substance as oil, and the eel has actually more oil than flesh-substance. Fish is rather more easy of digestion than meat, and when judiciously combined with bread, potatoes, and fatty substances, constitutes an exceedingly wholesome food. The waters of the ocean are so bounteously replenished with this kind of nourishment, that they are capable of furnishing a very much more abundant supply than they have yet been made to do. As if for the very purpose of pointing out that one of the objects for which fishes have been placed in the water, is the

furnishing nutrition for the human race, some of the kinds that ordinarily dwell in the deep ocean are driven by their instincts, at certain seasons of the year, to the shoal waters surrounding the land, where they are quite within the reach of man.

Fresh Vegetables contain a very large proportion of water, but there is in their structure also a considerable amount of flesh-making substance, besides starch and sugar. The *turnip* and the *carrot* are very nutritious, but deficient in fuel-substance upon the whole, so that they form good additions to fat meat like bacon and pork. The same may be said of *cabbages* and *cauliflowers*, which exceed even carrots and turnips in their nutritious power. Boiled cabbage and potatoes, beaten together with a little pork fat, salt and pepper, form a compound which approaches very nearly to the nature of bread, and which indeed is as nutritious as the richest Scotch oatmeal. One third part of *dried* cabbage consists of flesh-making substance. The *onion* is very rich in flesh-substance, and therefore forms a valuable addition to dishes containing much store starch and fat.

Fresh vegetables require, in most instances, to be boiled before they are eaten, because their juices contain disagreeable flavours, and in some instances unwholesome ingredients, which are, however, entirely removed by the influence of boiling water. **Ripe Fruits**, on the other hand, are vegetable substances, which have been thoroughly cooked by the maturing powers of the sun, and which have also been endowed, by the hand of Nature, with the most delicious flavours, in order to tempt man to partake of them in due season; they are, so to speak, *bouquets provided for the palate*. Ripe fruits consist principally of water holding in solution sugar and small quantities of flavouring oils. But they also contain in their juices peculiar acids, which exert wholesome influences over the blood in hot weather. They merely require to be

partaken of in moderation, and when thoroughly ripe. If not perfectly ripe, they should invariably be cooked, before they are eaten, in order that the process of sugar-making going on within their chambers, may be assisted and hastened. Almost every case in which fruit has seemed to be unwholesome, has been due either to its having been taken when unripe, or to its having been consumed in excessive quantity. The danger of its being eaten in undue amount is very great on account of the agreeable and tempting flavours with which its juices are endowed.

We have now to suppose that a wholesome but plain meal of good bread, and well-cooked meat and vegetables, selected and prepared according to the principles which have been explained, is set before you, and that you are about to apply these to their proper office of nourishing your body; how will you proceed? You will introduce the food, morsel after morsel, into your digesting bag. Now while you are doing this, take care to bear in mind what you are about. You are swallowing substances that will need to be brought most thoroughly within the power of the saliva and stomach-juices, in order that these may perform their wondrous dissolving work. **DO NOT, THEN, FORGET THE MILL.** Those ivory teeth have not been planted so firmly in your jaws for no purpose. They are meant for work, and for hard work too. Food is not intended to be bolted, but to be ground. Do not furnish one single morsel with its pass until it has been reduced to the finest pulp; then the saliva will get to every grain of the store-starch, and change it into serviceable sugar and gum, and the stomach-juice and liver-juice will get to every fibre of the flesh-substance, and reduce it to milk-like liquid, capable of entering the channels of the supply-pipes. If you bolt, instead of thoroughly grinding your food in the mill, be assured that the heavy lumps will prove too much for your digesting bag, however strong that

may be. The greater portion, after having oppressed the offended stomach with their unmanageable load, will cause griping and all sorts of annoyance, and will at last be dismissed from it, undissolved and without having furnished any nourishment.

Another important thing is to get enough food if you can; the body requires to be sufficiently nourished. On the other hand, however, be very careful that you do not attempt to get MORE THAN ENOUGH. If you do try to accomplish this you will fail in the attempt, and have to pay a heavy penalty, for your failure. Thousands upon thousands of people do try, and do fail, and then pay such penalties. You have heard it said that enough is as good as a feast. This is only a half truth, it does not go sufficiently far. ENOUGH IS FAR BETTER THAN A FEAST, if "*a feast*," means more than enough. There is more danger really in over-feeding, than in under-feeding. Countless numbers of underfed countrymen work through a long life in the fields, in happiness and contentment, and arrive at old age, almost without an hour of illness. But every overfed man sooner or later has to go to bed, and send for the doctor to help him to get rid either of rheumatism, or fever, or gout, or inflammation, which are forms of disorder into which superfluous food often changes itself. The life of labour and short commons, has upon the whole a much larger share of happiness, than the life of laziness and luxury.

But what is ENOUGH? That in regard to the feeding is a very serious question. At the first glance, too, it seems to be one which is not altogether easy to answer, because some men require more food than others, just as some steam engines consume more coal than others, to keep themselves moving; and just as some lamps take more oil than others, to keep up their flames. It is, nevertheless, a question which may be very easily answered. Every man who eats his meal slowly and deliberately,—*not forgetting the mill*,—HAS

HAD ENOUGH WHEN HIS APPETITE IS SATISFIED. Appetite really is Nature's own monitor. It is ruled, not by the state of the stomach, but by *the condition of the blood*. When so much blood has been taken from the supply-pipes of your body, by the working parts, that those pipes begin to be comparatively empty, their emptiness makes itself felt in your frame as hunger. Obedient to the hint, you find up food and eat. But while you are eating, what happens? First you seize the food with all the keen relish of a hungry man. Then as you eat on, the relish becomes less and less, and if your meal be a simple one, when you have had enough, all relish has disappeared, and the very things that tasted so deliciously at first, are insipid, so that you find no further enjoyment in the act of grinding and swallowing them. Go on eating after this, and the insipidity will be transformed into disgust; and if notwithstanding this you still persevere in forcing food into your stomach, that sensible organ will at last rebel against the tyranny, and return the whole which it has received upon your hands. Then it will be some little time before the stomach gets over the insult. Consequently the blood remains all this while in the impoverished state, and the result of the over-gorge is that the *body itself* is actually *starved*, instead of being *feasted*. If when your natural appetite for food is satisfied, and your enjoyment and relish of it have ceased, you have rich and high flavoured dishes set before you, the high-flavours will then still prove agreeable to the palate, and act upon it as a sort of excitement, and the natural appetite will have its work superseded by a false and artificial one, and you will go on eating under this temptation, until your stomach is over-crammed. All the so-called luxuries of cooking are merely devices *to make men eat more, who have already eaten enough*.

But when men who have already eaten enough, eat

more, what must happen? one of two things—either the stomach, being particularly vigorous, *will get through an extra amount of work*; then there will be more blood sent into the supply-pipes than the body requires, and the frame will be every where stuffed and oppressed with the load, to the danger of inflammations, rheumatism, and other-like disorders being set up: or the stomach *will be unequal to the task of doing extra work*; then the food which cannot be digested will decay and putrefy in the stomach and bowels, producing there all sorts of poison-vapours and disagreeable products, which will lead to stomach and bowel disorders, until nature, or the doctor, finds some way for their removal, or until something worse takes place.

Thrice favoured is he who is not daily exposed to the dangers of a luxurious table. Money, after all, is not *in itself* a blessing. It is only a blessing when it is possessed by those who know how to employ it for good purposes. In the hands of men who do not know how to employ it so, it often proves to be a curse.

Food, which is already in a state of commencing putrefaction or decay, is always dangerous for this reason, it forms poison-vapours and injurious products in the stomach, before its digestion can be completed in the natural way. If, however, meat about to be used is at any time found to be tainted, it will be at once rendered wholesome, if the most tainted part be cut away, the cut part being rubbed with a piece of charcoal, and the joint be then well boiled in water, in which a piece of charcoal has been placed.

Here then, in conclusion, are two or three **Golden Rules for the management of your feeding.**

NEVER HAVE ANY BUT THE PLAINEST AND SIMPLEST FOOD placed before you when you are hungry, whether you be rich or whether you be poor.

EAT OF IT UNTIL YOU FIND THE RELISH FOR IT DISAPPEARING.

THERE STOP, and on no consideration swallow another mouthful, UNTIL THE SENSE OF APPETITE AND RELISH COMES BACK to you.

By these means you will make sure that you always have nourishment enough, and that you never commit the folly of attempting to get too much. Keep ever present in your mind that it is *not food in the stomach*, BUT FOOD IN THE BLOOD, which confers strength, and that it is the natural appetite and relish for food, which tells you when the blood needs a fresh supply, and when the stomach is ready to deal with it in the blood's behoof. It is in order that you may not be deprived of the service of this natural indication that it is so necessary you should eat nothing but plain and simple food; bread, ripe fruit, and well-cooked meat, and vegetables, without spices and artificial flavours, such as persons who are called good cooks delight in. On account of the general occupations of life, and for other reasons, it proves to be convenient that meals shall be taken at regulated and stated times. Three meals a day, separated from each other by an interval of five or six hours, is a very good arrangement, because these intervals give the stomach a couple of hours' repose after each act of exertion.

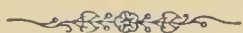
THE INFLUENCE

OF

WHOLESOME DRINK.

Richard S. Rogers

THE INFLUENCE OF WHOLESOME DRINK.



THREE quarters of that staunch body which you bring with you to the task of perusing these pages, my firmly-knit friend, notwithstanding substantial appearances, are nothing but thin WATER. If without your clothes you weigh 150 pounds, 113 of those pounds are mere liquid, which could be poured through the spout of a teapot, or even the channel of a tobacco pipe. Are you surprised to find yourself of so watery a nature? If you are so, you have no good ground for your wonder, for I can tell you that liquid has plenty of work to perform for your good.

You have already learned some of the important things which water has to do for you (*see* page 23 of "Use of Pure Water," and page 10 of "Value of Good Food"). More of a similar nature remains to be told, but this must not be dwelt upon now, because other matters require the attention. Thus much only, for the present, you must understand. Water is continually being drained away out of the supply-pipes of your body, and therefore requires to be as constantly restored to them, unless the blood is to be allowed to get so thick that it can no longer flow freely through their channels. The Great Architect of your body purposed that this should never happen, because if it did, all the powers of your frame, which are sustained by the

blood-movement, would suffer and flag. Therefore He has contrived a plan to prevent such thickening of the life-stream.

So soon as your blood has begun to grow thick and to flow slowly, it moves unwillingly and lazily through the structures of your throat, as well as through all other parts. The thick lazily moving blood there causes that unpleasant feeling which you call THIRST; a feeling which is so disagreeable, that the instant you are conscious of it, you seek to get rid of it by swallowing DRINK.

When you drink water to quench your thirst, the thin liquid goes down into your digesting-bag, and is then directly sucked up into the supply-pipes which run about all over its inside. There it *thins* the thickened blood, goes with it to the heart, and is thence pumped out through the channels of supply, taking its part in all the operations of life, diluting and changing here, and carrying and cleansing everywhere. There are various outlets through which the waste is poured away, but the principal of these lie upon the skin and in the kidneys. Before it is poured away, however, it actually forms part and parcel of all the structures of your frame; is for the time a portion of your life! It runs not merely through the digesting-canal of your body to the outlets for waste, but actually through the blood, and heart, and brain. Hence you see *good drink* may carry health, and vigor, and activity to all these internal and delicate parts; but *bad drink* may at once introduce mischief there, and danger, and disease.

The best possible drink is, of course, that which has the most power to fulfil the main office for which it is required; that is, the keeping the blood duly thin, for easy and ready flow. In its capability to do this, Nature's own liquid, PURE WATER, stands

altogether alone. No other fluid is at once so incorruptibly impartial, and so generously free; so ready to dissolve, so willing to carry, and so frank to return what is entrusted to it. When healthy people drink freely of pure water, the solid substance of their frames is actually washed and worn away, in consequence, more quickly; but this is directly made up to them by their getting stronger appetites, and eating more solid food. The food replaces the wear, and they do not waste, although their structure is more quickly consumed. The wear and tear *goes to work*, instead of *to waste*.

People do not, however, drink only pure water, perfect as that liquid is for the performance of the service for which it is swallowed. An immense amount of ingenuity and industry is spent in preparing beverages which are commonly preferred to plain water, because they have very agreeable flavours, and because it is believed that they are nourishing as well as thirst-quenching. These agreeable artificial beverages are principally prepared by the agency of boiling water, and the leaves and seeds of certain vegetables, which are cultivated for the purpose very extensively in various quarters of the globe.

Of these vegetable-furnished beverages, some are swallowed as soon as they have been prepared, and even while the warmth of the water is in a certain degree retained. Others are kept for some time, and allowed to pass into a condition of half decay, before they are used. The former class consist of the TEA, COFFEE, and COCOA, so familiarly known in most English households, besides being employed daily in a greater or less degree, by more than seven hundred millions of human beings.

Few persons in the British isles undervalue the fragrant drink, which pours forth its pleasant leafy

smell upon almost every table in the United Kingdom, from the cottage to the palace, once or twice in the day. British tea-drinkers are not, however, aware how enormous is the quantity of the fragrant leaf that is required every year for their supply, although only distributed to them by small spoonfuls. Scott Russell's monster steam-ship, in process of construction at Millwall, is considerably longer than the largest cathedral in England, and when finished would be able at once to wait across the sea an army of ten thousand men, with all their baggage, arms, and ammunition; or it would carry a compact burthen of twenty-five thousand tons. That monster ship, six times bigger than the largest line-of-battle ship in the Queen's service, would scarcely be able to bring to England, in one freight, the tea that is consumed in the island in a single year. Every twelve months, sixty millions of pounds of tea are made into drink in the British isles, besides thirty-five millions of pounds of coffee, and four millions of pounds of cocoa, articles which are, as will be presently seen, near kindred of the fragrant leaf, although seemingly of so different a nature.

Upon the hill-sides, in the remote land of China, there are thousands of acres of gardens filled with rows of plants, that look from a distance something like large gooseberry bushes, but which upon closer inspection more nearly resemble stunted japonica shrubs. Almost as soon as these shrubs have fully put forth their young leaves, men and women come round, and strip their twigs and branches bare. They then carry away the leaves, and dry them with much care, partly by exposure to the sunshine and air, and partly by the heat of fires of charcoal, until two-thirds of their weight have been steamed away. When the leaves are dried quickly, the shrunk and

crisped foliage is of a green colour. When they are left moist for a longer period, and are dried more slowly, they turn of a dull black hue. In either case, the crisped and curled leaves form the tea, portions of which are sent over the sea for the use of English tea-tables. The ground which is devoted to the growth of the tea plant, in China, would, if all joined together, form a farm nearly as large as Wales! Three millions and a half of acres are there covered with tea-bushes; and the entire produce of these acres in tea, is fifty times as large as the amount which is consumed in England. Fifty monster ships, like the one building at Millwall, would not hold therefore the tea produce of a single year. Of tea, and of its allies, coffee and cocoa, the earth yields yearly not less than *three thousand millions of pounds*; a quantity which it would take a grocer a hundred years to weigh out, if he worked at the rate of a pound every second. More than half the inhabitants of the earth are daily engaged in the occupation of consuming this vast amount.

Although these favourite beverages are now so extensively used, this has not been very long the case. In the year 1664 the East India Company made a present to the Queen of England of two pounds of tea, considering it a very rare and choice gift. The Chinese themselves do not seem to have drunk tea generally before the seventh century. Cocoa was brought from Mexico to Spain in the middle of the 16th century for the first time; and coffee was not seen in London until the 17th century. Hence it appears that these drinks are at least not actually *necessary* to human beings. The forefathers of the present generation did without them for centuries.

When articles, which were scarcely known to be in existence three centuries ago, have so rapidly

spread themselves through the world, that they are now viewed almost in the light of daily requisites by the larger half of mankind, it may very safely be concluded that there is some strong reason for the result. The reason may be a good one, or a bad one; the articles may be found to be of great service when employed, or they may be merely felt to produce agreeable feelings not necessarily serviceable. Is it possible to determine in which of these predicaments, tea and its allies, stand? As a first step towards the formation of an opinion in this matter, it will be quite worth any interested person's while to satisfy himself by a very easy experiment that there is something in tea, which careless notice and common use would never discover. Let him simply rub a teaspoonful of dry tea leaves to powder, and place it in a flat watch-glass, standing on the hot hob of a fire-place, a piece of stiff white paper being twisted up into the form of a sugar-loaf, and covered over the watch-glass and powdered tea. So soon as the tea has become very hot, a white steam-like vapour will rise from it, and be entangled in the paper, and if the paper cap be removed after a few minutes and be unfolded, its surface will be found to be sprinkled with a white glittering powder, something like pounded glass, or very fine salt. The powder is the vapour, turned into the powdery state, after it has been entangled by the paper. There is so much of this white powder in tea, that three grains can be procured from half an ounce of the leaves. Fifty pounds of good tea would furnish a pound of the white powder.

Having found out the existence of this white powder, hidden away in the black or green leaves of tea, the next thing we have to do is to discover, if possible, what its nature and character are. The chemists have

given it a learned name—*that* will not help us much in our present proceedings, still it may be convenient to know the curious substance by the title it bears among learned men. The chemical name of the white powder is THEINE. This means nothing more than the *white powder contained in TEA*. There is another really helpful consideration, however, which naturally occurs while we look at this substance. “Where did the white powder come from?” How did it get into the tea-leaf?

The white powder of tea was formed in the leaf, when that leaf was stretched out in the Chinese sunshine, as the plant grew on the side of the warm Chinese hills. It was made out of the food which the plant sucked in from its native soil and its native winds, in the little chambers of its living structure, at a great expense of wise effort and skill. No human artist can make a grain of that white powder, if he spends a life-time in the trial. In the little tea-leaf, as it grows on its sunshiny hill-sides, the most subtle and cunning powers are set to work by THE WISDOM which knows everything, and by THE HAND which holds and directs all things in man’s wonderful world. The result is, that out of coarse earth, and thin vapours, and fostering sunshine, the ingredients of the white powder are gathered together, and mixed, each in its proper proportions, and in the right manner, in the hidden recesses of the growing plant. God, in His own sublime language, says to the Chinese soil, and atmosphere, and sunshine—“*Let the white powder of the tea plant be*”—and there it is.

In a world that is so overflowing with perfect contrivance as this one, which serves as man’s dwelling place, it is not at all likely that this curious white powder is made by the tea plant in such abundance—twenty-five thousand tons of it at least turned out on

the Chinese hills every year, and scattered thence to the four corners of the world—without having some very good work appointed it to do. You will not wonder, therefore, that inquiring men, who know that all these thousands of tons get mixed in the ordinary course of ordered events with the flesh and blood of human bodies, should be very curious to find out what they are capable of doing there. Another very surprising fact also tends greatly to strengthen this curiosity. The coffee tree grows not in China, but in Ceylon, in Arabia, and in the West Indies. The Cocoa tree flourishes on the other side of the American continent, in Mexico and Peru. Yet the coffee and cocoa plants make out of the East and West Indian, the Arabian, and the South American soils, vapours, and sunshine, *exactly the same kind of white powder* that the tea plant manufactures on the Chinese hills! Plants so unlike in external appearance, and living in districts so remote from each other, first get to be used in similar ways in the preparation of beverages for millions of the human race. Then curious and prying inquirers find that there is one principle present in all these beverage-yielding plants. The common-sense inference is plain. It is most likely that it is *this one substance present in all* the three different plants, which has led to their being employed so generally in the preparation of drink.

The experiments which the chemists have tried with this white powder, with a view to the discovery of the action it may be able to exert upon living bodies when taken into them, appear to prove simply this. When swallowed in proper quantities it has a most wonderful *sustaining* power. It seems as if it enabled food which is taken with it to go one fourth part as far again in supporting the strength of the body, as it would without the addition; and if it does this, it is certainly not

because it adds *an equal amount of bulk* to the food, for a trifling pinch of *three or four grains* of the powder, as much as could be laid on a silver four-penny piece, is enough for the purpose during one day. If a healthy man has half a pound of bread taken from his daily meals, and three grains of the white powder of tea added in its stead, his body does not miss the bread. The white salt of tea, coffee, and cocoa, seems to possess the power of relieving the body from the effects of wear and waste, and so of decreasing its requirement of food.

This extraordinary substance also produces another very remarkable effect on the living body, when it is swallowed in these small quantities. It **CHEERS AND ENLIVENS**, at the same time that it aids in supporting the bulk and strength of the frame. The chemist finds, when he examines its precise composition, that it is even *more adapted to supply the substance which the NERVES AND BRAIN lose by wear and tear*, than to diminish the loss the flesh undergoes from the same cause. The white powdery ingredient of coffee and tea is most probably a rich and strong *nerve-food*, provided for the support of the nervous structure and brain, rather than for the nourishment of the flesh; it is **NERVE-MAKING SUBSTANCE** rather than *flesh-making substance*; and it exerts some mysterious and very extraordinary influence of lessening the waste of wear and tear in the structures of the living frame, without stopping their useful activity in the same degree.

In order that the nature and suspected action of this white powder of tea, coffee, and cocoa may be kept fairly in the mind, it may be well, instead of speaking of it by its learned name, to call it the **NERVE-FOOD INGREDIENT** of these beverages. Some further remark might very well be made touch-

ing the probable reason why these beverages, thus rich in a nerve-strengthening food, should have come into such general use in modern times, although scarcely employed in remote ages. But it may, on the whole, be best merely to say, that it is quite in accordance with the general management of the Gracious Providence who rules over man's world, that the additional wear and tear of nerve and brain, which of necessity follows from the increase of numbers in the human race, and from the advance of the arts and civilization, should have had some counter-acting compensation provided for its relief.

The best foods and the most valuable medicines are all as injurious as poisons, when they are taken in great excess. Every blessing which God has furnished to man is intended to be *used*, and not to be *abused*. Men are expected to learn how to employ them well, and how to avoid applying them improperly. The nerve-food ingredient of tea and coffee is no exception to this universal rule. When three or four grains of it are taken in the day, it refreshes and sustains; but if as much as ten grains are taken in the same time, it makes the blood flow with great rapidity through the supply-pipes of the body, and produces an uneasy feeling in the head, continued watchfulness, and trembling in the limbs. These effects, however, it must be remembered, are the results not of the use, but of the abuse of the substance. The Chinese account for the sleep-banishing power of tea, when taken in excess, in this way—They say that many centuries ago there lived in the Flowery Land a holy man, who desired to spend his entire life in watching and prayer, but who was constantly catching himself napping in spite of every effort to keep himself awake. Getting at last to be very angry with the eyelids, which would not keep

open, he one day determined that he would settle the business effectually by cutting them off. He put his shrewd plan into effect, and cast the offending eyelids aside upon the ground. The eyelids, however, directly took root, and grew up into two fine plants, which bore leaves, having the form of eyelids, and being fringed with hairs, like eyelashes, round their borders. The plants proved to be tea-plants, and the leaves of the descendants of those plants now make amends for the offences of their first parents, the holy man's eyelids, by furnishing a drink which keeps sleepy people awake.

Tea contains several other ingredients besides the *nerve-food* just now described. It has in it something which gives it the very fragrant smell, and delicate agreeable flavour, tea drinkers learn to value so highly. This fragrant principle, however, does not exist in the fresh tea-leaf. It is produced by a new sorting and arranging of the ingredients held in the fresh leaf, during the process of drying and roasting. The more carefully the tea is dried, the more delicious its taste and scent become. But tea has also an astringent matter in it, something like the astringency of the mouth-drawing sloe-leaf;—this is not very easily dissolved from it by boiling water. It is only taken up from it after it has remained in hot water for a very long time. Tea contains too a large amount of a true flesh-making substance, of a nature very closely resembling that of the meal of beans or peas. This is not at all dissolved in boiling water. It has been related that when the Queen of England first received her present of the precious tea, the royal cook, not quite understanding what ought to be done with it, boiled it well, and then dished it up on the dinner table, in the same way as spinach and other vegetables. If it be true that the Queen's cook did treat the

tea in this way, the plan was not altogether so absurd as it seems. Tea leaves, well cooked, and eaten after this fashion, would prove quite as wholesome and nutritious as beans and peas, the excess of the more active ingredients being removed by the boiling water, and the nourishing meal being principally left behind. Not more than a fourth part of this valuable production, tea, is really unnourishing wood and ash.

When a beverage is prepared from tea, if it be the object to get their finest qualities from the leaves, without regard to expense, the best method of proceeding is to use a large proportion of tea, pouring on as much boiling water at once as will make up the quantity required, and taking it off again after the tea has been standing about ten minutes. The water then dissolves principally the nerve-food ingredient and fragrant flavours, and leaves behind the coarser meal and astringent parts. When, on the other hand, the object is to get all the *nourishment* out of the tea which it can be made to yield, about a quarter of a small teaspoonful of carbonate of soda should be put into the water with the leaves, and the whole should be allowed to stand, covered up closely in a warm place, for a longer time. By this management, the nutritious meal and other coarser ingredients are partially dissolved into the water, as well as the finer parts. The addition of sugar and milk to the beverage of course increases its directly nourishing powers.

Half an ounce of good tea contains about three grains of the active *nerve-food* ingredient. This therefore is quite as much as any individual should use for the preparation of beverage for a single day. It is also somewhat important how even this moderate quantity is employed. Much of the bad effect which has been

attributed to *tea*, really has been due to the *way in which the tea has been drunk*, rather than to the *direct influence* of the leaf. People commonly swallow *many cups* of it in rapid succession, and pour it down their throats *as hot* as they can bear it. This is all very unreasonable and wrong. As a rule, never more than a *couple of small cups* of tea, made from about *two drachms* of the leaf, should be taken at one time, and even these should not be drunk until the beverage is so far cooled as to cease to give an impression of *actual heat* to the palate and stomach. The stomach itself makes things warm that are submitted to its influence ; there can, therefore, be no harm in *warmth*. Warm things are not weakening to the stomach, as some people conceive. It is only *hot things* that are weakening, because they force and over-goad the activity of the organ, and then leave it weary and exhausted from the forced work it has been made to perform.

COFFEE is the berry of an evergreen tree, which grows to a height of about twenty feet, and which is largely cultivated in Arabia, Ceylon, Jamaica, and the Brazils. The berry is plucked when sufficiently ripe, and carefully stored away. It is principally composed of a sort of hard paste or meal, similar to that of the almond or bean, which is destined by nature to form the earliest nourishment of the young germ contained in the seed. When this meal is exposed to strong heat, it is partly turned into the fragrant flavour, which is familiar to all drinkers of coffee. Hence coffee is always roasted before it is employed in the preparation of beverage. The process is best accomplished by placing the berries in a hollow cylinder of iron, kept turning rapidly round over a clear fire until they put on a light chestnut colour, when they require to be cooled quickly by tossing them up

into the air. Roasted coffee contains, besides its fragrance, the white *nerve-food* already alluded to in speaking of tea, a remnant of the nutritious meal, unaltered by the roasting, and a slightly astringent matter. Its nature is, therefore, singularly like to that of tea, and its action on the living frame is precisely the same. When drunk in moderation, coffee supports and refreshes the body, and makes the food consumed with it go further than it otherwise would. Coffee is, upon the whole, less astringent than tea; it also contains only half the quantity that tea has, weight for weight, of the active *nerve-food*. Hence it can be taken stronger than tea, and so has more of the other nourishing ingredients in any given bulk. A cup of strong coffee generally holds about the same quantity of the active nerve-food as a weak cup of tea.

As with tea, so with coffee; it requires to be prepared differently, accordingly as the object is, to get from it the finest flavour, or the greatest amount of nourishment. The most delicious coffee may be made by using a tin vessel, called a Percolator, having a false bottom at mid-height, drilled full of fine holes, and a spout coming off from beneath the false bottom. Finely-ground coffee is to be pressed and beaten down firmly upon the false bottom, and then boiling water is to be poured over it through a kind of coarse cullender, so arranged as to break its descent into a boiling shower. The hot water thus gently rained down on the coffee then drains gradually through it, carrying all the finer parts and flavours with it into the vessel beneath, but leaving behind the coarser matters. For the convenience of consumers, coffee is now commonly removed from the roaster at once into a mill driven by steam, and is there ground while still hot. It is then pressed out from the mill directly into tin cases prepared to receive it, these being immedi-

ately closed very carefully. By these means the coffee powder is sent out, ready for use, with all its most excellent qualities clinging about it. Three drachms of ground coffee of this quality are abundantly sufficient to furnish two small cups of a most delicious beverage.

When quantity of nourishment, rather than fineness of flavour, is the thing desired, the ground coffee should be placed in a clean dry pot standing over the fire, and be kept there until thoroughly hot, being stirred constantly, so that it may not burn. About five grains of carbonate of soda should then be added for each ounce of coffee, and boiling water be poured on, the whole being *closely covered up* and allowed to stand near the fire, without simmering, for some time. When about to be used, it should either be gently poured off into cups, without shaking it, or it should be strained through a linen cloth into another pot. An ounce of coffee employed in this way is sufficient for the preparation of two pints of strong nutritious drink.

A small evergreen tree grows in the West Indies, Mexico, and Peru, which bears a large fruit something like a melon. In this fruit there are a great number of seeds resembling beans. When the fruit is ripe, it is plucked from the tree and split open, and the seeds are picked out and dried in the sun. After these beans have been roasted in an iron cylinder, in the same manner as coffee, they, too, become bitter and fragrant, and are turned into what is known as Cocoa. To form *cocoa nibs*, the husk of the roasted bean is stripped off, and the rest is broken up into coarse fragments. In the preparation of *Chocolate*, the cocoa nibs are ground up and turned into a sort of paste, by admixture with sugar and spices. The unhusked bean is also crushed between heavy rollers, and made

into a coarser kind of paste, with starch and sugar, and is then sold in cakes.

Cocoa contains about the same quantity of the *nerve-food* ingredient as tea, and besides this it also contains a nutritious meal. More than half its weight is, however, made up of a *rich oily substance*, nearly resembling *butter* in its nature. When cocoa is prepared by stirring the paste up in boiling water, all these several ingredients are present in the drink. It is then as nourishing as the very strongest kind of vegetable food, and scarcely inferior to milk itself. It indeed is richer than milk in one particular; it contains twice as much *fuel substance*, or *butter*, and if the *nerve-food* ingredient be taken into the reckoning, it is scarcely inferior in supporting power. On account of its richness it often disagrees with persons of weak digestion, unless it be prepared in a lighter way, that is, by simply boiling the cocoa nibs in water, and mixing the beverage produced with enough milk to reduce its great excess of oily principle. Cocoa serves at once as an agreeable and refreshing beverage, and as a highly nutritious food for healthy and hard-working people. It has in itself the excellencies of milk and tea combined.

The beverages which are also prepared by soaking the seeds of vegetables in hot water, but which are not then drunk until a further change of the nature of partial decay has been produced in them, are of a very unlike character to those which have been hitherto under consideration. Although there are several different kinds of this class, they all stand together under the family name of BEER. Now this much must at once be said for these beverages. There is in all of them both *flesh-making substance* and *fuel-substance*. The first gives to the liquor its *body*, and the second confers its *sweetness*. The

barley-corn contains the same kinds of ingredients as the wheat-grain, and by the operation of malting the starch is chiefly turned into sugar. If a gallon of strong ale be boiled over a fire, until all the more watery parts are steamed away, there will be found at the bottom of the vessel rather more than a quarter of a pound of dry remainder. This is *flesh-making substance*, and *sugar*, which were originally taken out of the malt. If a gallon of milk were treated in the same way, there would be found nearly a pound of similar dry substance. Strong beer therefore contains about one-third part as much nourishment as an equal quantity of milk. When beer is drunk, its watery parts are at once sucked from the digesting-bag into the supply-pipes, to be poured through the body with the blood; this is how beer quenches the thirst. The thicker portions are pushed on through the sluice-gate of the stomach in a digesting state, and are, in fact, treated in every respect as ordinary food.

Mixed with the thinner parts of beer, which are thus sucked into the supply-pipes, there is, however, an ingredient which is not as *unquestionably* nourishing as the thicker principles, and which certainly is not as good a thirst-quencher and dissolver as water. Flesh-making substance and fuel-substance, either in the state of starch or sugar, may be kept unchanged any long period of time if thoroughly dry, and shut up from the air. When they are moist and exposed to the air, they directly begin to spoil and decay. In beer, these substances are mixed with a large quantity of water, and are exposed to the air, at least during the brewing. Hence, in beer, both are found in a spoiled and decaying state. In this case, the process of decay is called *fermentation*, or "puffing up," because the vapours produced by the decay, froth the

sticky liquid in which they are set free. The yeast which rises to the surface of fermenting beer, is decaying and spoiling flesh-making substance. The spoiled fuel-substance (sugar) froths and bubbles away into the air as vapour.

But the fuel-substance (sugar) does not, as it decays, bubble away into vapour all at one leap. It makes a halt for a little while in a half decayed state, and in this half decayed state it has a very spiteful and fiery nature. In that fiery and half decayed condition it forms what is known as **ARDENT**, or *burning SPIRIT*. Beer always has some, as yet, undecayed and unchanged sugar remaining in it, when it is drunk, but it also always has some half decayed sugar or spirit, and bubbling vapours formed by the progress of decay. It is these ingredients of the beer which give it the fresh and warm qualities for which, as a beverage, it is chiefly esteemed.

The spirituous ingredient of fermented liquors is directly sucked with the water out of the stomach into the supply-pipes of the body, and poured everywhere through them. There is no doubt concerning that fact. Animals have been killed and examined a few minutes after fermented liquor had been placed in their digesting bags, and the ardent spirit has been found in great quantity in their supply-pipes, their hearts, and their nerve-marrows and brains.

But some doubt does yet remain as to what the exact nature of the influence is which the **ARDENT SPIRIT** exerts, when it has been introduced into these inner recesses of the living body *in small quantity*, and as much *diluted* by admixture with water as it is in most beers. Some persons, whose opinions cannot be held to be without weight, believe that diluted spirit is capable of aiding the nourishment of the body—of acting as a sort of food. Others of equal

authority are convinced that it can do nothing of the kind.

But however the matter may appear regarding the power of ARDENT SPIRIT to nourish, no doubt can be entertained of the fact, that it certainly is *not* a *necessary food*. There is actually nothing of a material kind in the bodies of human creatures, which is not also present in the frames of the irrational animals. The same kind of structures have to be nourished, and the same kind of bodily powers to be supported in oxen and sheep as in men. But oxen and sheep fatten, and grow strong, and are maintained in health without ever touching so much as a single drop of ardent spirit. There are hundreds of men too who preserve their vigour and health up to great ages, without even tasting fermented liquors.

It must also be admitted that there are great numbers of people who use fermented liquors *in moderation* every day, of whom the same can be said. But it is to be feared that those who are safely *moderate* in their employment of these treacherous agents, are a really small band compared with those who allow themselves to be continually within the reach of unquestionable danger. In the United Kingdoms of Great Britain and Ireland, with a population amounting to rather less than 30 millions of individuals, when the numbers were last reckoned, there are yearly 61 millions of gallons of ardent spirit consumed as beer; 30 millions of gallons as spirit; and nearly two millions of gallons as wine.

There is, yet again, another very important point of view from which the habitual moderate use of fermented liquors must be contemplated. A pint of strong beer is in itself no very great thing. Many people swallow it almost at a single draught, and in less than a minute. The trifling act, however, entails

one serious consequence when it is performed day by day. A pint of strong beer cannot be bought at a less cost than threepence. Threepence a day, at the end of a year, amounts to £4 11s. 3d. If it be only laid by and made no use of, at the end of sixty years, it amounts, under the same circumstances, to £273. If employed, instead of being laid by, it might be improved at the end of sixty years into a large fortune. Hundreds of men have made thousands of pounds with smaller means.

Money, of course, is of no great value in itself; it is only of value when applied to good service. But herein lies the gist of the matter. Money always can be made good use of. If a young man at the age of 18 begin to lay by threepence every day, instead of buying a pint of beer with it, and continue to do the same thing for two years, he may purchase with the saving an allowance of £10 a year, to commence at the age of sixty-five years, and to be continued as long as he may thereafter happen to live. If he laid by threepence a day for five years, he could purchase with his savings, at the end of that time, an allowance of ten shillings a week, to commence at the age of sixty-five years. If a young man at eighteen begin to lay by threepence a day, and continue to do the same thing from year to year, he may at once purchase the certainty of being able to leave behind him a little fortune of £300 for his wife or children, or any other relatives who may be dear to and dependent upon him, whenever death puts an end to his earthly labours! Surely no rational and prudent man would ever think even 22,000 pints of profitless beer an equivalent for such a result of his industrious labour. It is by no means too strong an expression to speak of the beer as profitless, for this reason. A gallon of strong beer contains *a quarter of a pound* of nourish-

ment, bought at the cost of a couple of shillings. Two shillings would purchase about *three pounds* of excellent mutton or beef. The direct money-value of ardent spirits, swallowed every year by the inhabitants of the British isles, exceeds NINETY MILLIONS OF POUNDS sterling.

Although there may be question and doubt as to the character of the influence this fiery substance exerts, when poured out to the living human frame, through the supply-pipes, in moderate quantity, and weakened by mixture with a large proportion of water, all question and doubt disappear when *its action in greater strength and in large quantity* comes to be considered. An inquiring physician, Dr. Percy, once poured strong ardent spirit into the stomachs of some dogs, to see what would happen to them. The poor animals fell down insensible upon the ground directly, and within a few minutes their breathing had ceased, their hearts had stopped beating, and they were dead. Some of the dogs were opened immediately, and it was then found that their stomachs were quite empty. All the ardent spirit had been sucked out of them in a few short minutes. But where was it gone to? It was gone into the blood, and heart, and brain, and there it was discovered in abundance. It had destroyed life by its deadly power over those delicate inner parts.

Human beings are instantly killed when they swallow large quantities of strong ardent spirit, exactly in the same way as Dr. Percy's dogs. A few years ago two French soldiers made a bet as to who could drink the largest quantity of brandy. Each of them swallowed seven pints in a few minutes. Both dropped down insensible on the ground; one was dead before he could be picked up,—the other died while they were carrying him to the hospital.

A man in London soon after this undertook to drink a quart of gin, also for a wager. He won his bet, but never had an opportunity to receive his winnings. He fell down insensible, and was carried to the hospital, and was a dead body when he was taken in.

There can be no doubt, therefore, what strong ardent spirit, in large quantities, does for the living body. IT KILLS IN A MOMENT, as by a stroke. It is a virulent poison, as deadly as prussic acid, and more deadly than arsenic. Even when it is not taken in sufficient abundance to destroy in the most sudden way, it often leads to a slower death. Striking illustrations of this truth are presented continually in every corner of even this civilized land. It has been fully ascertained that not less than ONE THOUSAND PERSONS DIE FROM THE DIRECT INFLUENCE OF ARDENT SPIRIT, in the British isles, every year.

When people do not die directly upon swallowing large quantities of ardent spirit, it is because they take it so gradually that nature has the opportunity of WASHING THE GREATER PORTION OF IT AWAY through the waste-pipes, before any sufficient amount of it has gathered in delicate internal parts for the actual destruction of life. Nature has such a thorough dislike to ardent spirit in the interior of living bodies, that the instant it is introduced into their supply-pipes and chambers, she *goes hard to work to drive out* the unwelcome intruder. When men have been drinking much fermented liquor, the fumes of ardent spirit are kept pouring out through the waste-pipes that issue by the mouth, the skin, and the kidneys; the fumes can commonly be smelt under such circumstances in the breath.

When fermented liquors are drunk in a gradual way, but yet in such quantity that the ardent spirit collects more rapidly in the blood than it can be got

rid of through the waste-pipes, the fiery liquid produces step by step a series of remarkable effects, growing continually more grave, as more of the spirit flows in the channels of the body.

In order that all the actions of the living human body may be properly carried on, three *nerve-overseers* have been appointed to dwell constantly in the frame and look after different departments of its business. One of these has its residence in the brain; that nerve-overseer has charge of the REASON, and all that belongs to it. Another resides under the brain, just at the back of the face; that nerve-overseer looks after all that relates to FEELING or SENSE. The third lives in the *nerve-marrow* of the backbone; that has to see that the BREATHING and the PUMPING OF THE HEART go on steadily and constantly. Of these three superintendents the brain-overseer and the sense-overseer are allowed certain hours of repose at night; they are both permitted to take their naps at proper times, because the reason and the sense can alike be dispensed with for short intervals when the creature is put safely to bed, or otherwise out of harm's way. Not so, however, with the breathing and blood-pumping overseer. The breathing and the blood-movement require to be kept going constantly; they must never cease, even for a short interval, or the creature would die. Hence the nerve-marrow overseer is a WATCHMAN as well as an overseer. No sleep is allowed *him*. He must not even nap at his post. If he do, his neglect and delinquency are immediately discovered by a dreadful consequence. The breathing and blood-flowing, which are his charge, stop, and the living being, served by the breathing and the blood-streams, chokes and faints.

These three nerve-overseers have been fitted to perform their momentous tasks in the entire *absence*

of *ardent spirit*, and they are so constituted that they cannot perform those tasks when ardent spirit is *present in any great amount*. Ardent spirit puts them all to sleep. The *Reason-overseer* is overcome the most easily; he is the most given to napping by nature, so he goes to sleep first. If more spirit be then introduced into the blood, the *Sense-overseer* begins to dose also. And if yet more be introduced, the *Nerve-marrow WATCHMAN* ceases to be a watchman, and at length sleeps heavily with his companions.

Now, suppose that you, my firmly-knit reader, were in an unlucky moment of weakness to turn aside from your usual course of temperance and sobriety, and to drink fermented liquor until its fiery spirit gathered in your brain, and put your *Reason-overseer* to sleep, what think you would be the consequence? This would be the consequence—you would for the time cease to be a *reasonable being*. You would probably still walk about the streets, and go hither and thither, and do all sorts of things. But all this you would accomplish, not with a proper and rational knowledge of your actions. Your reason and understanding being fast asleep while you were walking about, you would properly be living in a sort of BRUTAL existence, instead of a *human and reasonable* one. You would have laid aside the guide who was intended to be your director in your responsible human life, and you would be rashly trusting yourself in a crowd of the most fearful dangers, all your responsibility still upon your shoulders, without the inestimable advantage of the advice and assistance of this experienced director. Like the brutes, you would then find yourself to be easily roused to the fiercest anger, and set upon the worst courses of mischief; you would find yourself readily filled with the most uncontrollable feelings of passion and vio-

lence, and liable to be run away with by them at any moment, and caused to do things that a rational creature could not contemplate without the deepest anguish and shame.

There is no lack of proof that human beings do the most brutish things when their reasons and understandings are put to sleep by strong drink, while their sense-overseers and their animal powers still remain active. Every place and every day afford such in wretched abundance. One impressive instance, however, may perhaps be related with advantage. On the night of the 28th of June, 1856, two drunken men, whose names were James and Andrew Bracken, rushed brawling out from a beer shop in one of the suburbs of Manchester. They ran against two inoffensive passengers, and in their blind and brutish rage began beating them; one was knocked down and kicked about the head when on the ground. He was picked up thence a few minutes afterwards and carried to the hospital, where it was found his skull had been broken. The poor fellow died in the course of the night.

In the next assize court, at Liverpool, James and Andrew Bracken stood in the dock to be tried for their brutal act. The counsel who defended them said that it was only a drunken row, and there was no murder in the case, because neither of them knew what he was doing. The judge and the jury, on the other hand, decided that this was no excuse, because they *ought* to have known what they were doing. They had laid aside their reason and become *brutal* by their own voluntary act, and were therefore responsible for any deed they might perform while in the brutal state. The jury returned a verdict of **WILFUL MURDER** against Andrew Bracken, and the judge passed sentence of death upon him, coupling the sentence

with these words, "You did an act, the ordinary consequences of which must have been to kill. It was a cruel and a brutal act, and you did it, wholly reckless of consequences. You have therefore very properly been convicted of wilful murder." The wretched man was removed from the dock shrieking for mercy, with upraised hands, and exclaiming, in heart-rending tones, "OH! MOTHER! MOTHER! THAT I SHOULD BE HANGED." No doubt he was very much surprised to find himself a condemned convict and A MURDERER, and had never intended to be so. He had no spite against his victim, and had probably never even exchanged a word with him. No drunkard therefore, when about to put his reason to sleep by intoxicating liquor, should ever overlook the fact, that he will for the time cease to have control over his actions, and that when that reason awakes, *he may find himself* like Andrew Bracken, A PRISONER AND A MURDERER. Whether he do so or not will depend on no will or determination of his own, but upon the mere series of accidents that will surround him while in his self-inflicted, helpless, and brutal state.

The case of Andrew Bracken, sad and striking as it is, by no means stands alone in the annals of crime. At the assize, held at Lancaster, in March, 1854, it was shown that in that single court 380 cases of grave crime had been detected and punished within a very short period, and that of the 380 cases TWO HUNDRED AND FIFTY, INCLUDING NINE MURDERS, were to be directly traced to the influence of drunkenness.

But if having ceased to be sober, my strong-bodied reader, you did not happen to commit murder, or do any other act of gross violence while in the *brutal stage* of drunkenness, yet nevertheless went on swallowing more and more of the intoxicating liquid

until your SENSE-OVERSEER was put to sleep as well as your REASON-OVERSEER, what do you think would chance to you then? Why, you would have ceased to be dangerous to your neighbours, and have become in a like degree dangerous to yourself. You would no longer have power to commit murder, or to do any other act of cruelty, because you would sink down on the ground a *senseless and motionless* lump of flesh. You would be what the world calls *dead-drunk*. But you would not in reality be *dead*, because the NERVE-MARROW WATCHMAN still continued at his post, and awake. The lump of prostrate flesh would still breathe heavily, and blood would be made to stream sluggishly from its beating heart. In this *insensible stage* of drunkenness, however, you would have ceased to be able to exercise any care over yourself. In it the drunkard is sunk as much lower than brutal life as the brutes are beneath reasoning life, inasmuch as he ceases to be able to exert the power which all brutes possess of perceiving the threatening of danger, and turning aside from its approach.

But yet again, rational reader, let us suppose that when you became for the time a lump of insensible flesh, you had already swallowed so much stupefying spirit, that there was enough to put the *nerve-marrow watchman* to sleep, as well as the *reason and sense-overseers*, before any fair quantity could be cleared away out of the waste-pipes of the body. Under such circumstances breathing would cease, and all heart-beating would stop. You would then indeed be DEAD-DRUNK in the full sense of the fearful term. Senseless drunkenness is dangerous to the drunkard himself, not only because he could not get out of the way if danger were to come where he is lying, but also because he *of necessity is placed in an insensible state upon the brink of a precipice*, from the depth

beneath which there could be no return if he once rolled over. Whether he will ever again awaken from his insensibility, or whether his earthly frame shall have already commenced its endless sleep, is a question which will be determined by the accident of a drop or two more, or a drop or two less, of the stupefying spirit having been mixed in with the coursing life-streams. The man who kills a fellow-creature in a fit of drunken violence, commits an act of murder; the man who dies in a fit of drunken insensibility, is guilty of self-slaughter. In its first degree, drunkenness is BRUTALITY; in its second degree, it is SENSELESS STUPIDITY, of a lower kind than brutes ever know; in its third degree, it is SUICIDAL DEATH. It will be felt that it is important this matter should be looked fairly in the face, and that there should be no reserve in the employment of words strong enough to characterize truly the fearful vice, when the statement is made that there are not less than seventy thousand *confirmed drunkards* known to be living at the present time in England and Wales.

It is now a well-proved and unquestionable fact, that a young man of fair strength and health, who takes to hard drinking at the age of 20, can only look forward to 15 *years* more of life; while a temperate young man, of the same age, may reasonably expect 45 *years* more! The habitual drunkard must therefore understand that, amongst other things, he has to *pay the heavy penalty of 30 of the best years* of existence, for the very questionable indulgence that he buys. The doctor also has a sad account to give of aches, and pains, and fevers, and weakness that have to be borne by the intemperate during the few years' life they can claim. Whatever may be the true state of the case with the *moderate use* of fermented liquors, their *intemperate use* is a fertile source whence

men draw disease and suffering. INTemperance is ANOTHER OF THE INFLUENCES WHEREBY MEN CAUSE SICKNESS AND DECAY TO TAKE THE PLACE OF HEALTH AND STRENGTH. The doctor has likewise, it must be remarked, a tale of his own to tell concerning the beneficial power of fermented liquors, when employed as medicines in certain weakened and already diseased states of the body.

There is one earnest word which has yet to be addressed to those who have *satisfied their consciences* that they may with propriety indulge their inclination to use fermented liquors in moderation habitually. Have they also satisfied themselves that they can *keep to the moderation* their consciences allow? Have they taken fairly and sufficiently into consideration their own powers to resist urgent allurements? Have they well weighed the possible influence, in their own case, of the enticements, which agreeable flavours and pleasurable exhilaration, necessarily bring into operation? Have they sufficiently pondered upon the admitted truth that there scarcely ever yet was a confirmed drunkard who did not begin his vicious career by a very moderate employment of the seductive liquors? If they have done this, then let them still nevertheless go one step further and carefully determine also for their own case, *what moderation is*, and while doing this, let them never forget that when the thirsty man drinks *a pint of table-beer*, he pours a TEASPOONFUL OF ARDENT SPIRIT into his blood; when he drinks *a pint of strong ale*, he pours TWO TABLESPOONFULS OF ARDENT SPIRIT into his blood; when he drinks *four glasses of strong wine*, he pours ONE GLASS OF ARDENT SPIRIT into his blood; and when he drinks *two glasses of rum, brandy, or gin*, he pours from THREE-QUARTERS OF A GLASS, TO A GLASS, OF ARDENT SPIRIT, into the channels of his supply-pipes.

The habitual drinker of port wine has a more or less strong fancy that his favourite and so called "generous" beverage fills him with "spirit" and "fire." This fancy is indeed not without some ground. Government has recently caused a very careful investigation to be made of the strength of the port wines that are furnished to the English markets, and the investigation has disclosed the startling and unexpected fact, that the weakest of these wines contain 26 per cent. ; ordinary specimens of them from 30 to 36 per cent. ; *choice* specimens 40 per cent. ; and what are called the *finest* wines as much as 56 per cent. of proof ardent spirit. The port wine drinker therefore actually receives even more "spirit" and "fire" with his ruby drink than he is himself aware he has bargained for. There are rich flavour and delicious odour, no doubt, in his wine, and so much the greater is his danger. These serve only to conceal a wily enemy who is lurking beneath. A *bottle of ruby port wine in the stomach* commonly means HALF A BOTTLE OF POISONOUS FIERY SPIRIT IN THE BLOOD, AND HEART, AND BRAIN.

FINIS.

THE ADVANTAGE
OF
WARM CLOTHING.

THE ADVANTAGE OF WARM CLOTHING.



THERE are men, called chemists, who know a great deal concerning the nature of different kinds of substances, and who, in consequence of this knowledge, are able to bring about very surprising changes and effects. These men have places, termed laboratories, or labour shops, in which they work, and which are divided into distinct chambers, besides being furnished with all sorts of instruments and vessels. Sometimes liquids are put into these chambers and vessels, and there turned into solids. Sometimes both liquids and solids are converted into invisible air. Sometimes beautiful crystals, white and blue, green and red, are brought out of transparent and colourless fluids. Sometimes a few grains of dusty-looking powder are made to vanish into smoke with an explosion that shakes the ground for yards; and sometimes waste rubbish is transformed into delicious scents, resembling those which are produced from the violet and the rose. Even dull, black charcoal has been changed into the sparkling and precious diamond. It would require a very large book merely to number the wonderful feats these men of science are able to perform. Chemists, indeed, in the present day can do much more by their knowledge and skill, than magicians pretended they could accomplish in the olden time.

Chemists make use of many very powerful agents in their laboratories, to aid them in carrying out their objects and plans. Among these agents there are two that stand before all the rest both in strength

and in general usefulness. These prime assistants of the chemists are FIRE and WATER. The *water* is employed to dissolve substances whose little particles it is desired to bring closely together. When two different liquids thus formed are mixed, all the particles in the two come together and act upon one another. Fire is used to soften substances, and loosen the hold of their little particles upon each other, so that they may afterwards be readily mixed together. Water *dissolves* bodies; that is, makes them liquid by uniting them with itself. Fire *melts* bodies; that is, makes them liquid without the aid of water.

Now there is one object which the chemists often have in view, when they put different kinds of substances together, in a dissolved or liquid state, in the chambers and vessels of their laboratories; that is, to get something out of those substances, which was before hidden away in them, in order that they may turn that something to practical use. Thus the chemist mixes together saltpetre, sulphur, and charcoal in the right proportions to make gunpowder. Then having rammed a charge of the gunpowder down into the tube of a gun, with a bullet on the top of a charge, he applies a spark to the gunpowder, and makes it change into smoke and vapour. Something which was hidden away in the gunpowder ceases to be concealed when it is changed into smoke and vapour, and becomes active enough to be able to drive the bullet out of the muzzle of the gun with a force that carries it through the air for a mile, and perhaps then buries it deep in the ground, or in a plank of wood. This is an instance of the way in which chemists *produce motion*, by changing the state and condition of material substance.

I had occasion the other day to watch a still more interesting example of this strange result of the chemist's skill. In a chemist's laboratory, prepared for a particular service, I saw several small chambers of metal, half copper and half zinc, into which were

poured blue vitriol in water, and an acid, a partition wall of pipe-clay standing between. The dilute acid and the zinc were slowly turning into white vitriol, which remained dissolved away in the water; but out of this new-made white vitriol there flowed a power, which was conveyed along a wire, and which made a needle, hung up on a pivot before me, twitch from side to side, almost as if it had been a living thing. I was told that this power set free in the solution, in consequence of the changes brought about there, would run along the wire to the distance of a hundred, or even of a thousand miles, and would there make another needle work and twitch in the same way. In short, I was looking at the electric telegraph at work, and learning that the agent which made the signal afar, was simply a power that had been hidden away in the different substances the chemist put together in the metal chambers, and that was set free and enabled to operate in the production of independent motion, so soon as those substances acted upon one another, and altered the form and state in which each was existing.

Now, my good friend, your living body, and my own, are laboratories, in which changes of precisely the same kind are constantly brought about; your living body, and my own, are made of an enormous quantity of separate chambers and vessels, very small it is true, but nevertheless such as can be seen quite distinctly when they are looked for with the microscope. In these small chambers and vessels different kinds of substances are thrown together, exactly as the zinc, and acid, and blue vitriol are in the laboratory-chambers of the electric telegraph. The chambers and vessels of the living laboratory lie between meshes of the supply-pipes of the body, and it is indeed their minute cavities which are drenched by the circulating streams of the dissolved food, (*see "Value of Good Food," page 10*) and in which that dissolved food gets to be transformed into flesh and fat, gristle and

bone, tendons and skin, fibres and nerves. The blood, which is pumped forth with such vigour from the heart, creeps along slowly through the smallest and furthest branches of the supply-pipes, in order that plenty of time may be given for all these changes to be worked out in the chambers of the frame. But the fibres and skin, the flesh and the nerves, when they have been built up, are also changed into waste substance by admixture with yet other ingredients which the blood brings to the little chambers. In the cavities of the living laboratory as in those of the electric telegraph, these changes of substance lead to the setting free of agents before concealed, which agents then operate in the production of movements and of other living effects. When I now raise my arm up above my head, I am able to do so because some of the flesh of which my arm is composed, is changed into another kind of substance, the moving power being set free during the change. When I feel this hard stone which I take up in my hand, I am able to do so because some of the substance of which my body is made, is changed into another kind of material at the instant that I feel. This then is how **STRENGTH COMES OUT OF FOOD**. The food is changed into flesh, and the flesh is converted into two distinct parts, waste substance and moving and living power. The power was originally concealed in the food, placed there by the Provident hand of the Divine Author of Nature, in order that it might be forthcoming for this useful service when it was required. In simple words, material substance is destroyed in order that power may be extracted from it. Material substance, in living bodies, is turned into power. This is the mechanism by which God works in these, the most wonderful of the productions of His hands.

It will hardly be necessary, after all that has been already said elsewhere, to point out that the prime assistant of the chemist, **WATER**, acts in the living laboratory

exactly as it does in the artificial ones. It loosens, dissolves, and mingles together the various substances which are to act upon one another. It is in the dissolved food, and the liquid blood, which flow into all the chambers and vessels of the living body, and which build up in them the fibres of living structure, and then transform and destroy those fibres, in order that the power there stored away may be obtained.

But it is still more remarkable that the other prime assistant of the chemist, FIRE, should also be employed in the living frame, in loosening its particles, and in quickening the operation of the various changes of substance upon which the production of power depends. It has been shown that in the body of a full-grown man there is as much heat produced in a single day, as would serve to make 80 pints of cold water boil, and it has also been stated that this heat is produced in the body, exactly in the same way heat is produced in the steam engine; that is, by the burning of fuel. The heat is set free by the change of condition in material substance, precisely as power is procured. When the water employed in a steam engine is made to boil, the heat that causes the boiling issues from the coal, because that substance ceases to be coal, and turns into smoke and vapour. Just so the fuel-substance of the body ceases to be fuel-substance—starch, sugar, and fat—and turns into vapour which is steamed away, leaving the heat which was concealed in the substance to warm the frame.

The furnace which is kept burning in the living laboratory, to quicken all the operations which are being carried forward in it, and to exalt its strength, is a slow and gentle one. It never burns quickly enough to cause light and flame, as common fires do. The body is never even raised to the heat of boiling water, which is far less than that of burning coal. It is only made of blood-heat; that is, 68 degrees of the heat-scale warmer than freezing water,—in its warmest parts. Boiling water is 180 degrees of the

same heat-scale warmer than freezing water. The furnace of the living body sometimes burns a little more quickly than it ought, then the body gets warmed into fever. Occasionally it burns considerably less quickly than it ought, then the body is chilled, and its living actions and powers are slothful and languid. Upon the whole, however, its heat is steadily kept up at pretty much what it ought to be, that is at one hundred degrees of the scale, which gives 32 degrees for frost.

Now this is how the furnace of the living body is kept smouldering on in its gentle and even way. Little blasts of air are constantly puffed in upon the burning fuel. That out-and-in play of your chest as you breathe,—that is the puffing of air blasts into certain chambers of your living laboratory, to keep up its smouldering fires. The more quickly and deeply you breathe, the warmer your body becomes; and the more slowly and softly you breathe, the colder that body remains. The same action which blows a fresh wind through the living frame to clear away its impure vapours, also serves to fan its hidden flames, and keep its fuel burning. When the breathing is stopped the fires of the body go out, just as those in a common furnace do, when their air-blasts are arrested, and the body becomes dead cold.

You will remember that when the fresh air is drawn into your lungs as you breathe, it enters a large quantity of little cavities or chambers, which have, all of them, a fine network of the supply-pipes stretched out upon their walls (*see page 15 of "The Worth of Fresh Air"*); and that as the blood rushes on in its course through these supply-pipes, it sucks air into itself from the air-cavities, and carries it, in its own streams, to all parts of the living structure. Air goes with the blood to that strong force-pump, the heart, and is then pumped out with the blood to every crevice and fibre of the body. Every part of the body therefore receives, by means of the supply-

pipes and in the blood, heat-fanning air, as well as supporting food.

When air reaches the living flesh and nerves, by thus flowing to them in the blood-streams of the supply-pipes, it sets up those changes of substance in their structures which lead to the production of movement, and feeling, and other kinds of living power. When it reaches the dissolved fuel, contained in the blood and in the various little furnace-chambers of the laboratory, it sets up those changes in the fuel which lead to the production of warmth. The fuel is slowly burned in the blood and in the chambers of the frame, and there gives out warmth, as a fire does whilst it is burning in a grate. This warmth consequently heats the blood, and the warm blood carries its heat wherever it goes. The entire body thus becomes as warm as the blood, or nearly so.

Now where do you think all the heat originally comes from, that is procured from burning fuel? The heat is stored away in the fuel, as one of the ingredients of its composition, until it is burned. But where was the heat obtained from, which is stored up in the fuel? Of course, when the fuel was made, that heat-store had to be supplied to it, as well as its other ingredients. First let us see when and how the fuel was made, and perhaps we shall then be able more perfectly to understand this matter of its warming qualities and power.

In the case of coal, it is not a very difficult task to trace the stored-up heat to its source. But what a surprising truth it is, which becomes apparent when the task has been performed. The heat is, so to speak, *bottled-up sunshine*! Coal is dug up from deep mines hollowed out in the earth. But at one time it was wood, growing on the outer surface of the globe, and covered with foliage which was spread out into the genial air. Traces of the leaves and stems from which it has been made, are still discovered in its substance. Long centuries ago, the vast forests

containing these trees, were overthrown by some tremendous earthquake, and swept away by strong floods of water, and so the tree-stems were at last deposited in hollow basins, and were there buried up by millions and millions of tons of heavy rock and soil. There, where they were buried, they have remained, turning more and more black and dense through the process of slow decay, until they have been dug up piece-meal to feed the furnaces and fires of the existing generation of men.

Now you know very well that trees only grow in warm weather, and in sunshine. In winter time their branches stick out stiff and bare, and do not increase in the slightest degree. But in summer time they clothe themselves with beautiful masses of foliage, and suck in from both the air and the soil large quantities of vapour, of liquid food, and of sunshine. All these they combine together into fresh layers of timber. All these therefore were buried in the ground as timber, when those old forests were overthrown which form the coal-beds. Timber cannot be made in *cold* weather, because *heat* is one of its necessary ingredients. But as all the warmth of the weather comes from the sun, it is *the sun's warmth which is stored away in coal*, and which is set free and made useful when the coal is burned.

The grand source of all warmth on the earth is that brilliant light which God has placed in the sky to rule over the day. In a summer's day you sit down in the bright sunshine, and bask in its warmth. In winter time, when the sky is covered with clouds, and ice and snow lie thick over the ground, you place yourself indoors near the glowing fire; but strange to say, it is still the sun's genial warmth that you experience. If the fire be of coal, it is warmth which was borrowed from the sun centuries ago. Reflect for an instant upon this marvellous arrangement entered upon, for your comfort, ages before you were yourself called into being! When those coal-making forests

spread their broad masses of foliage out in the sunshine, there were no human creatures existing upon the earth; and, indeed, not even the flocks and herds, which are so essential to man's welfare, had been framed. Neither cattle nor sheep could have found pasture on the plains which yielded them support. The great duty of those forests must have been to store up genial warmth for then uncreated generations of beings, who in due season were to appear, and to avail themselves of the provision thus made.

But suppose that you had neither fresh nor stored-up sunshine to fall back upon, and had to depend entirely for your warmth upon that furnace which is carried about in your living laboratory, and kept alight by the puffing of your breath. Still that internal heat comes originally out of the sunshine. Just before the time when man was placed upon the earth, the beautiful family of plants was created, which fills the gardens with roses, and which yields the apple, the pear, the cherry, the plum, the apricot, the peach, the almond, the strawberry, and the raspberry. Just at the very time was planted on the globe, the vegetable tribe which furnishes the different kinds of nourishing grain, and which provides pasture for grazing animals. The fruits, the grasses, and the grain were all commissioned to extract power and warmth from the sunshine, and to store it up in such a form that the influences could conveniently be introduced into the interior of the living body. Living animals which are warmer by the fuel contained in their food, procure their heat from sunshine that was stored up, as it were, but yesterday. When animals live upon flesh, and get their strength out of the lean fibre, and their warmth out of the fat of this food, still it must be remembered that the flesh has been fed on the grass of the field just before. The main office of the plant in creation is thus to store up in a fixed and convenient form supplies of active energies which can be turned to account by animated

frames. The plant effects this end by preparing the food upon which animals live;—that food which, besides keeping the body in repair, serves also *to furnish it with warmth, and to give it strength and power.* (See page 7, “*Value of Good Food.*”) How admirable and beneficent is this plan, whereby the genial influence of life-quickenning sunshine is economized and preserved for the service of one-half of creation, by the instrumentality of the other half!

In the far distant regions of the north, there are places on the earth to which no daylight or sunshine comes for four long months at a time. During this gloomy period the ground goes on, from hour to hour, scattering more and more of its heat, until it is almost as cold as the chill space in which the great world is hung, and has indeed more than 100 degrees of frost. The land and the water alike get covered up by one broad and thick sheet of never-melting ice and snow. There is not a leaf, or a grass-blade, or a vegetable stalk any where in the wide white desolation. But there are animals, and human beings, who are born and die, and who maintain a prolonged existence in it. Let us just look in upon one of the households in this drear frost land, and see what the odd community is like.

In the midst of a broad snow-waste, through which the sharp wind is howling with a fearful sound, there is a small mound nearly covered by the snow-drift. We perceive this mound by faint star-light, the only gleam that comes down from the sky. A few feet away from the mound we discover a small hole blocked up by a lump of snow. We move the lump aside, and stretching ourselves out at full length on the ground, we squeeze into the hole head foremost, and crawl along a narrow passage, burrowed out in the firm snow for about a dozen feet. We then find ourselves in a vault 10 feet wide and 15 feet long, and so low that we can scarcely sit upright within it. This is the inside of the mound. It is the interior of

a hut or dwelling-place of these people of the drear frost-land. The walls of the hut are built of large stones piled together, with a padding of frozen moss covered over them, and with thick ice and snow covered over the moss.

There are 12 living individuals, men, women, and children, huddled together in this close vault. They have no fire to keep them warm. Indeed there is neither coal nor wood, which they could use to light a fire, within many hundred miles. There is in one corner of the hut a broad shoulder-blade of a large quadruped laid flat, and in the hollow of this blade there is some crushed seal's blubber, and some soft moss, with long cotton-like rootlets. The end of the moss is burning with a small, dull, smoky flame. This is the only artificial source of light and warmth within the hut.

But these people are all of them almost entirely naked; and they are dripping with perspiration, they are so warm. Outside of the hut, in the dim star-light, the air is actually a hundred degrees colder than freezing water. Yet inside, in the nearly as dim lamp-light, there are almost as many degrees of warmth. The air is there as hot as the hottest summer day in England! All this heat is produced in the slow furnaces of those twelve individuals' own living bodies. They have lost the sunshine for months, and everything around them is much colder than ice. They are living upon the flesh and blubber of seals, and sea-horses and white bears, animals which they killed before the sun went away, the meat being kept for them through their long winter by the preserving power of the frost. The sunshine of past-away summers has given its heat to plants; the seals and sea-horses have fed on those plants, or upon smaller animals which have done so, and have transferred the heat into their own blubber; and now the benighted savages are getting the heat out of the blubber to keep their own flesh and blood warm and

unfrozen. In that close hut, where no sunshine can come for months, the savage inmates have nevertheless abundant stores of the warmth of sunshine, which have been laid up and preserved for their service. Such care Providence takes even of these, the rude and barbarous children, whose lot He has cast in the desolate outskirts of the world!

The rude people who dwell in the cold frost-land of the north, remain warm through their long severe winter, without the aid of artificial fires, because they economize the warmth which is produced in the slow furnaces of their bodies, and prevent it from being scattered away as quickly as it is generated. If they were to sit themselves down in the open air, instead of in their close huts, the warmth produced in their bodies, would be thrown off from the outer surfaces of these as fast as it was set free from the fuel. In the close huts, on the other hand, this warmth first heats the air contained within the stone walls, and is then a very long time in getting any further, and so prevents more heat from being rapidly scattered from the internal furnace.

These human inhabitants of the Northern Ice Land have a companion in their desolate haunts, who does not build himself a hut after their fashion, but who has instead a somewhat similar protection against the severe cold of the long northern winter, provided by nature. This creature goes upon four legs, sometimes swimming in the water, and sometimes stalking along upon the ice. He is very powerful and fierce, is armed with sharp claws two inches long, and has teeth which can bite through iron bars half an inch thick. He is able to tear iron and tin to pieces as if they were merely paper or pasteboard, and he feeds upon seals, birds, foxes and deer, which he manages to catch by his cunning and address. This savage creature is often killed by the rude natives, who hunt him with dogs and spears, but in the absence of man he is the fell tyrant of the domain. He prowls about

on the snow-wastes, destroying every living body which comes within his reach ; and he remains exposed to the severest cold of the long dark winter, lying upon the ice and snow, without having his life-blood frozen by its chill power. The reason of his safety is that he wears a nature-provided great coat of very warm fur. His skin is every where covered by long shaggy hair of a yellowish-white colour, which has a thick down-like under-growth closely packed beneath. This coat of soft fur is so long and thick, that it prevents the heat produced in the slow furnace of his body from escaping into the cold air. It answers the same purpose to him, that the snow-covered hut does to his human neighbours.

Men have no warm shaggy coats of this kind furnished for their use by nature, but they are enabled to supply the deficiency through the exertion of their own intelligence and ingenuity. They borrow warm coverings from other creatures whenever they stand in need of such aid. Thus the rude human inhabitant of the Ice Land hunts and kills the bear, and then before he feasts upon its flesh, he strips the fur robe from the carcass, and adapts it to his own naked body. So soon as the northern ice-people come out from their huts into the cold air, they put on coats and trousers of bear-skin, with the long sharp claws pointing out as toes to their boots. These odd savages look almost like small bears themselves when their white fur hoods are drawn down over their heads, and their limbs are compactly muffled up in the claw-tipped robes which they have taken from the bodies of their prey.

Men in civilized lands do not put the *skins* of other animals upon their own bodies, but they do what is precisely the same thing in effect. They borrow silk from the worm, or cotton from the grass, or flax from the linen-plant, or wool from the sheep, and by their constructive skill, they spin and weave these substances into cloths, which are much more

convenient than raw skins for the fabrication of garments, and which can be made as warm, when this is required. In every case, however, this artificial clothing acts in the same way as natural fur. It is warm, because it prevents the heat, which is produced in the slow furnace within the body from escaping quickly from the little chambers of the living laboratory. Clothing does not really warm the body, it merely *keeps it warm*; prevents it from being cooled as it would be if this covering were not placed between its surface and the outer air.

Warm bodies constantly grow colder, when situated in spaces which are more chill than themselves, provided always that there be no furnaces, quick or slow, within them, for generating new supplies of heat. They do so, because they give the excess of heat which they contain to the neighbouring space, in the attempt to make it as warm as themselves. Warm bodies are always very generous, and disinclined to keep what substances near to them are less freely supplied with. If a metallic pint pot, filled with boiling water, be placed on the ground in air which has only the warmth of a March English day—some fifty degrees of the heat scale,—the water gets colder minute by minute until it remains no warmer than the air and ground which are around it. The rapidity with which warm bodies are cooled depends upon how much colder than themselves the space around them is. If one pint pot of boiling water be placed in out-of-door air that is cold as freezing water, and another be placed at the same time in a room where the air has the warmth of a mild summer day, the former will be deprived of all its excess of heat much sooner than the latter.

Warm bodies lose their excess of heat in two ways. They *shoot* it off into surrounding space. This is what learned men call "*raying*" or "*radiating*" it away. The sun, you know, shoots or rays its heat off to the earth, and so does the fire to your body

when you stand before it. But warm bodies also communicate their heat to substances which touch them, provided those substances be colder than themselves. Place your hand upon a cold metal knob, and you will feel that your hand grows colder as it gives portions of its heat to the knob. This is what learned men call "*conveying*" heat.

Now the clear transparent air permits heat to be shot off, or rayed through it with great freedom. But it does not readily receive heat "by conveyance," so long as it is still. If you put your hand into still air which is as cold as a cold metal knob, you do not know that the air is so chill as the metal because it does not make your hand so cold. The heat is not conveyed away from your hand as quickly. When air is *moving*, instead of being still, the case is, however, altogether altered. A current of air, or wind, carries away heat from warm bodies very quickly as it blows over them. It does so, because each fresh little particle of air which is pressed against them, receives its own share of the heat, and conveys it away, leaving fresh particles to come up in their turn, and do the same thing. A pint of boiling water in a metal pot placed in a strong wind having 50 degrees of heat, would lose all its excess of heat as soon again, as it would if standing in still air having the same warmth. The old plan of cooling hot tea or broth by blowing it, is correct in principle though not in accordance with good taste.

The laboratory of the living animal body, has the supply of its fuel, and the capacity of its air-blasts, so arranged, that just about as much heat is supplied through its internal furnace, as is lost from its surface by "raying off" and "conveyance," when the surrounding air has a warmth of 60 degrees of the heat scale, and when its surface is somewhat protected by a light covering of clothing, to lessen the rapidity with which the heat is shot off and conveyed away. The heat is then produced as rapidly in the internal

furnace, as it is thrown off from the outer surface, and the consequence is that the animal *feels comfortably warm*. It only feels uncomfortably *hot*, when more heat is produced in the furnace of the living laboratory than can be scattered through its surface. And it only feels uncomfortably *cold* when more heat is scattered from the surface than can be kept up through the burning of the inner furnace.

But in winter time the cold external air carries away heat much more quickly from the surface of living animals, than the warmer external air does in summer time. Here then is a little difficulty to be met, if the warmth of the body is to be kept precisely the same in both seasons. It is requisite that it should be always maintained at the same point, because that point is the one which is most suitable for the operations which are being carried on in the vessels and chambers of its laboratory. Nature has two distinct ways in which she insures this end.

In the first place, are you not aware that you get more hungry in winter than you do in summer time? All living animals have pretty much the same experience as yourself in this particular, and the reason is that Nature intends, during the cold season, to have more fuel introduced into the supply-pipes of the body for the warming of its structures. The furnace of the laboratory gets quickened in a small degree;—its slow fires are fanned into slightly increased activity, more fuel is burned, and so more heat is generated to meet the greater demand for it, dependent on the influence of the external cold.

But nature also thickens the clothing of animals during the cold season, and so affords increased obstruction, through which the escaping heat has to force its way. Have you not observed the sleek silky coat which the horse wears through the summer in our English climate, and then noticed at the beginning of winter how this sleek coat is exchanged for a thick, fuzzy shag, that looks more like wool than

hair? The warm winter coat economizes the heat, produced in the furnace of the living body, and keeps it from being scattered to waste as quickly as it is through the sleek summer coat. This is nature's other plan of meeting the difficulty brought about by the changing temperature of the air. Nearly all animals belonging to temperate and cold climates, have this change of apparel provided for them in spring and autumn, but in some cases the change is rendered very striking in consequence of a summer garment of bright gay colours being replaced by a winter one of pure and spotless white. The fierce tyrant of the Ice Land himself, the Polar Bear, has a dingy yellow coat during the summer, but puts on furs as snowy as his own realms when once the summer sun has disappeared. These white winter furs are always warmer than dark ones. Birds which do not migrate to warmer regions of the earth in the cold season, have winter and summer suits of apparel, just in the same way as quadrupeds. In the winter a lining of thick soft white down is added beneath the outer feathers. There is one little bird which comes to England in the late autumn, driven there by the still greater cold further north, and which is familiarly known as having two remarkably different costumes for his English and his foreign residence. In England the snow-bunting appears with a white body and tail, but abroad and in summer time he is distinguished by a brilliant black tail and back, and a body and head of pure white.

Man follows the example which nature has set before him, in the matter of clothing. He prepares himself stout warm garments for winter-time, and thin cool ones for the summer; and not only this; in the hottest regions of the earth, where there is most sunshine, he commonly goes nearly naked, while in the coldest regions, near the poles, he puts on the heaviest and warmest woollens and furs that he can procure. Now this is one reason why man has been *apparently* so un-

cared for by nature in the particular of clothing. The seeming indifference and carelessness is really consideration of the highest kind. All the different races of the lower animals have their own narrow tracts assigned them for their residence. In these tracts there is no very extreme diversity of temperature; and provision is therefore easily made to adapt their clothing to it just so far as is required. The human race, on the other hand, is intended to cover the entire earth, and to subdue it; to spread itself from the burning tropics to the frigid poles. The heat which has to be borne in the tropics, is as much greater than that which is experienced near the poles in winter-time, as boiling water is hotter than ice. At the poles, 100 degrees of frost often occur. In India, there are occasionally 130 degrees of heat under the canvass of tents. It therefore becomes an affair of almost absolute necessity, that the skin of the widely scattered lords of the creation, should be as unencumbered as possible, and that warm clothing should have to be prepared and added as a covering whenever circumstances call for its use. The head only, of the human being, has a natural fur garment. This part of the body is covered with hair, because the most delicate portion of the entire frame, the brain, is contained within it. The skull is protected by hair, that the brain may not be hurt by too sudden a change from cold to heat, or from heat to cold.

There is another advantage attending upon the arrangement which has left human beings dependent upon an artificial supply of clothing, and which has ordained that they shall come into the world with naked skins. In consequence of this arrangement, it is very easy to secure that amount of cleanliness which is necessary for the preservation of the health of such delicately framed creatures. The artificial clothes can be altogether changed at will, and they can be washed and aired, as they never could be if they were inseparably attached to the skin. Then

too, they can be removed from the skin in the early morning, or at convenient intervals, and its surface can be thoroughly cleansed and purified by bathing with water. Just think of the difference of going into a bath of refreshing water unencumbered by clothes, and of doing the same thing with thick, dabby garments clinging about you, and having to shake yourselves like great Newfoundland dogs when you come out; and also recall to mind the pleasure you experience every time you change soiled linen for clean, and you will become sensible how much you owe to beneficent nature for having left you destitute of the feathers of the bird, or the fur of the bear. The extreme importance of making a fair use of this privilege has been already alluded to in its proper place. (*See page 29 of "The Use of Pure Water."*)

But nature has effected yet another very bountiful provision for the comfort and safety of her tender charge, the living human animal. Even when only covered by very light clothing, it is possible human beings may be placed in air which is so warm, that heat is not carried off from their bodies so fast as it is produced in the interior furnace. In India, it sometimes happens that the air gets to be even hotter than the living body. All movement of the air then, heats, rather than cools. Under such circumstances, nature adopts a very effectual course to prevent warmth from collecting more and more in the frame, until a disagreeable and injurious amount has been reached. Having first reduced the supply of fuel to the smallest limits consistent with keeping the fire going, by lessening the appetite, and by taking away the craving for heating food, and having given a hint to adopt such outer coverings for the body as are as little obstructive of the passage of heat as possible, the heat drenches the surface of the frame abundantly with moisture, which has the power to cool by its ready evaporation. Take a small piece of wet linen, and lay it upon your forehead, or upon your arm,

leaving it freely exposed to the air, and you will find, that as the moisture evaporates from the linen, your skin underneath will feel colder and colder. The heat of the skin is used up in converting the moisture of the linen into steam, exactly as the heat of a fire is used up in converting the water of a kettle into steam when this is made to boil. The steam flies away with the warmth of the skin very rapidly, and consequently, the skin soon comes to feel cold. Now, when the body gets to be very warm, and the overheated blood is rapidly pouring through the channels of its supply pipes, then the three millions of little holes or pores, which lie upon its surface, are opened, and floods of vapour and water are poured through them producing just the same kind of effect as wet linen would do. (See page 25 "*Use of Pure Water.*") This action is termed "*perspiration*," or a "steaming through" the pores of the skin. The breathing blows up, or fans the slow furnace contained within the living animal frame, and so heats it above the surrounding air. The perspiration carries away portions of this heat when it has been raised too high, and so cools the heated body down. Some moisture also escapes as steam from the lungs and through the mouth in breathing, thus assisting the perspiring skin in its office of diminishing the excessive warmth of the body. You have often seen dogs, which have been heated by running, pant with opened mouths and outstretched tongues, the vapour streaming forth from their gaping throats. Dogs cool themselves in this way because they have very little perspiration passing through their skins. Their perspiration is really from their throats, rather than from their skins. Human beings sometimes lose in hot weather, as much as five pints of water during twenty-four hours, by exhalation through the lungs and skin.

Give me now, good reader, your close attention for just a few minutes while I return to the notion with which we started on beginning the consideration of

this subject, so that I may fit it into its right place, and leave it well packed away with the other notions that we have gained, while studying the value and uses of air, water, and food. Your body is a living laboratory, formed of an enormous quantity of little chambers and vessels. From a strong central force-pump, placed in the middle of that laboratory, liquefied food, or blood, is streamed out through branching supply-pipes to the several chambers, to carry to them the materials that have to be operated upon in their cavities for the production of animal power and warmth. The force-pump acts by repeated short strokes, but the liquefied food flows through chambers of the laboratory in continuous, even currents, because the supply-pipes are made of yielding and elastic substance, like India-rubber, and not of hard, stiff substance, like metal or wood. As the liquefied food gushes out from the force-pump, the elastic walls of the supply-pipes are stretched by the gush, but directly afterwards, they shrink back again, as India-rubber would do; shut close a valve that prevents all *return* of the liquid into the force-pump, and so compel the liquid to run onwards in the other direction, through the pipes. Before the shrinking in of the pipes has altogether ended, the force-pump renews its stroke, and so the onward flow of the liquid never stays, although the pump has to make beat after beat. The liquefied food gushes out from the force-pump with a speed of about a foot in each second; but it has to supply such an enormous host of small chambers in the remote parts of the laboratory, that it does not flow through them with a speed greater than an inch in a minute. This, however, is no disadvantage, as it affords plenty of time for the full carrying out of all the intended changes in those chambers, whereby animal power and warmth are to be produced.

Remember, then, that as your heart beats in your chest, second after second, the red blood flushes through every crevice and every fibre of your living

frame, just as it does through your cheek when it is crimsoned with a blush. Seventy or eighty times every minute, your beating heart pumps, and constantly, so long as you are alive, the flushing blood streams on everywhere. The blood, however, streams on in this continuous way, because its flow is *not stopped*, even when it has reached the remotest chambers and fibres. The trunks of the supply-pipes divide into branching twigs, which get very fine indeed where they are in connection with the working chambers of the laboratory, and which then lead on into *return-pipes*, that are gathered together into enlarging trunks. These, in their turn, are collected into main tubes which end in the cavity of the heart. At the extremity of these main trunks of the return-pipes, valves are so placed as to prevent the pumping action of the heart from forcing the blood back into them. Thus, as your heart pumps, swelling out and drawing in its walls, the blood flows into its cavity by the return-pipes, and is squeezed out therefrom through the supply-pipes. It always streams *in one direction*. It *circulates* through the living frame which it flushes ; that is, it goes in an endless circle, now through the heart, now through the supply-pipes, now through the return-pipes, and now starts once again through the heart.

But as your blood thus circulates through your living frame, fresh nourishment, newly dissolved food, is added in some places to its streams ; in other places nourishment and fuel are taken from it to furnish the active chambers of the laboratory with warmth and power ; in other places worn-out substance is added to it to be carried away in its current ; and at other places this worn-out substance is poured away from it through the outlets provided for its removal. The principal outlets through which the waste of your living laboratory is poured away, have been already spoken of in detail—they are the pores of the skin ; the drains of the laboratory ; and the pores of the

lungs, that with the mouth form the chimney of the laboratory through which the smoke and the vapours from the burned fuel, fly away. In addition to these outlets, there is, however, another series by which some denser matters, which cannot be got through either the skin-pores or the lungs, are streamed away. This series is continually in operation, but the details of its arrangements are so ingeniously planned, that it accommodates its work to the demand of each passing instant. When, for instance, the perspiring-pores of the skin are widely opened for the cooling of the frame, and an increased amount of liquid is consequently steamed away through them, then these outlets are narrowed; but when, on the other hand, the skin-pores are closed, or when any extra flood of liquid is thrown into the interior of the frame during cold weather, then these additional outlets at once are brought into very active play.

Now just imagine the case of a large town, in which there is a certain quantity of waste liquid needing to be carried away through drain-pipes every day, but in which also there occur occasional excessive floods of rain, which must have a way of escape provided for them whenever they happen. How clever you would think it if some skilful engineer fixed valves in the drain-pipes of that town, which kept themselves fast closed under ordinary circumstances, but which opened of their own accord whenever the pressure of an extra flood came, and so allowed the excess of liquid to flow safely and freely away. Such has really been the proceeding of the skilful Engineer of your living frame. Your body is exposed to the risk of occasional excessive floods. When the weather is very cold, for instance, the pores of your skin are closed, and not more than a single pint of liquid can force its way out through them, in the place of the four pints which would pass in warm weather. Much of the water which would otherwise have escaped from the channels of the

supply-pipes, then remains in them, coursing round in the progress of the circulation. Sometimes, too, in all probability you will be tempted to swallow an unreasonable quantity of liquid, beyond any demand the mere process of cooling an over-heated frame can require. But whenever you have thus set up an unusual internal flood, sluice-gates are opened, and through these the excess is rapidly poured until the flood is got rid of. In those parts of your body which have been named the kidneys, there are pores through which waste liquid is always draining, without being turned into vapour or steam; but in the kidneys there are also chambers composed of very fine walls, which are strong enough to prevent fluid from passing through them when it is only pressed by a gentle force, but which are not strong enough to do so when the pressure becomes greater in consequence of the over-flooding of the supply-pipes. The kidneys are the sluice-gates of your body, provided with outlets for common use, and with self-acting valves which come into operation upon occasions of excessive flood.

Thus astonishing, then, is the care which has been taken in perfecting the arrangements of the heating-service of that complicated laboratory, your living body. Fuel is thrown into an internal furnace, more or less plentifully, according to need. The fuel is there burned, and fanned by air-blasts, which are strengthened or weakened as the occasion may require. The heat produced by the burning is economised by external packings and wrappings, or it is scattered by the opening of evaporating-pores on the external surface, and by the drenching of that surface with steaming moisture; and self-acting valves are provided to regulate the quantity of liquid contained in the supply-pipes, so that the cooling pores may never be forced into mischievous activity by the mere pressure of excess in their channels, at a time when the body is already sufficiently chill.

When cold is suddenly applied to the previously warm skin of the living body, it shuts up all the perspiring pores at once, and then empties its supply-pipes of their streaming blood *inwards*. You know how pale and numb your skin becomes on a cold frosty day, when you stand quietly in the chilling air. That is because the cold squeezes all the blood out of the small vessels of your skin. But where do you suppose the squeezed-out blood goes to? It flows directly into the several internal parts, choking up and overloading their channels. If the skin be soon made warm again, the overloaded parts of the inside once more get emptied, and recover their usual freedom; but if it be *kept cold*, then their overloading and choking continues, and great discomfort is experienced. All kinds of inflammations and disorders are produced in this way. What are commonly known as colds are internal obstructions of this nature. Cold in the head is an affection in which the lining of the nostrils is overcharged with stagnating blood. Sore throat is caused by a similar condition in the lining of the throat. And cough by the same state in the lining of the vessels and cavities of the chest.

The mere application of a chill temperature to the skin is not alone, however, enough to give a cold. This result chiefly comes when the application has been made while the body is in a weakened or exhausted state, and therefore has not the power to resist and overcome the internal disturbance of the even blood-flow. Colds are nearly always caught in consequence of a sudden exposure of the body to a chill, either when it is in a state of exhaustion and fatigue from sustained exertion, or when it has been for some time previously over-heated. Excess of heat itself soon produces exhaustion, and depression of the strength and the powers of life. When a chill is applied to the skin while the body is fresh and strong, as, for instance, when a man pours cold water over

himself the instant he gets out of a warm bed in the morning, after a sound and refreshing sleep, it does no harm, for this reason;—First, the blood is driven away from the supply-pipes of the skin by the cold, and flows inwards; but the refreshed heart, then becoming sensible of its arrival, rouses itself to increased effort, and prevents obstruction by pumping on the liquid more vigorously. By this means blood is soon sent back again to the skin in great abundance, and makes it *glow* with renewed warmth. It is only when the cold was very severe, or very long continued, that this re-action, as it is called, would be hindered, and internal disorder be likely to be set up.

Here, then, is one of the advantages of employing warm clothing. It prevents the catching of cold by protecting the skin from sudden chills at a time when the internal parts of the frame are depressed and unable to meet, without injury, the effects which follow upon it. If at any time you are very weary, and very warm, remember, then, that you must keep yourself warm by drawing more clothes round you, or by some other plan. Want of attention to this very simple proceeding, or absolute ignorance that it ought to be adopted, is among the common means *whereby men lay up for themselves disease and suffering*, and cause sickness to take the place of health.

How constantly it happens, at the very first appearance of fine weather in spring, that sore throats and coughs and colds are met with everywhere. This is nearly always because people are then tempted to throw aside the warm clothing which they have used through the winter, and so to leave their skins very much more exposed to the influences of the sudden chills, which are quite sure to occur at this time. Just observe what nature herself does in this matter. She does not take off the horse's warm coat the moment the spring sunshine bursts out in the sky. She compels him to keep it upon his back,

at the risk of his being a good deal encumbered by it now and then, because it is better he should submit to this small inconvenience for a time, rather than be exposed to the danger of grave disease. As you may advantageously take a lesson from the bee as to the management of fresh air in your dwellings, so you may advantageously go to the quadruped to learn how to manage the alteration of your clothing at the change of the seasons. When you see the horse putting on his fine silken garment for summer, follow his example; but until you do see this, be wise, and still keep within the protection of your winter wools and furs.

There is another plan by which people every day expose themselves to the danger of catching cold, and of so falling into disease. They commonly sit in very draughty rooms;—apartments which are warmed by bright fires, but which are at the same time chilled by cold wind rushing in at large crannies and crevices, far beyond the quantity which is needed for the mere supply of pure air. Such rooms are warm and cold climates brought together into a nutshell. There is a scorching summer near the fire, and a freezing winter near the window at the same instant. Merely walking about the room therefore takes the body in a moment from one climate to another, and this must happen sometimes when the body is not prepared to meet, and accommodate itself to, the change. A chilled surface, and internal obstructions result, and colds and diseases follow very soon. The inside of rooms should be in winter time very much what they are in the summer season; that is not too hot, but equally warm in all parts, and with a sufficient current of air passing through them to keep them pure, although not with enough to set up dangerous draughts. If there are draughts, then the protection of warm clothing must be constantly employed, to prevent the chilling influence from attacking the skin. The arrangement of the fireplace named at *page 27 of*

"*The Worth of Fresh Air*," enables the rooms of dwelling-houses to be kept in a very desirable and healthy state, in this respect. The ventilating valve into the chimney provides for the free removal of the impure air, while the narrowing and closing of the chimney-throat serves to discourage and stop draughts, and to keep the air at a tolerably even warmth everywhere throughout the apartment. Warm and undraughty dwelling-rooms are the natural allies of warm clothes in health-preserving power.

There is another very excellent companion and helper of warm clothes in this good work. This helper is EXERCISE. If when you are weary and warm, and have no additional clothes to draw round you on the instant to prevent a chill, you sit down or stand still in the cold wind, you will be nearly sure to catch cold, and to be made ill. But if, on the other hand, you keep moving about until you can either clothe yourself more warmly, or go into a warm room, then you will be almost as certain to escape without harm. Exercise aids the heart in keeping the blood moving briskly, and if at any time there is an inclination for the blood-flow to stagnate and get obstructed internally, then exercise overcomes the obstruction, and sends the lagging blood cheerily on towards all parts of the frame, and back towards the skin. Brisk exercise thus possesses the power to overcome mischief, as well as to prevent it. (*See page 16 of "The Worth of Fresh Air."*) Its influence in quickening and sustaining the flow of the blood-streams through the supply-pipes of the body, necessarily leads in the end to the strengthening of every structure in the frame, and to the rousing of every operation that is carried on in the living laboratory. Every one who values the blessing of health and strength will do well, if his daily task is not one of exertion in the open air, to make such a task for himself. One hour at least out of the twenty-four should be spent in quickening the blood-streams, and

in deepening the breathing by walking briskly in some open space where the fresh winds of heaven have free play.

But we will now imagine that in ignorance of all these particulars, or in consequence of some long-continued exertion and exposure which the demands of duty made it altogether impossible for you to avoid, you have caught a cold, and are beginning to suffer from a sore throat, or a cough, or some other sign that matters within are not as they should be. What, under such circumstances, ought you to do to stop the cold, and get rid of it, before serious disorder is brought about? Here, again, warm clothing is of the highest value. If the chilled surface be at once closely covered up, and be kept covered, the blood is soon drawn back to the skin, and the internal obstructions are in this way overcome. The best possible way to get rid of a cold quickly, for those who can follow it, is to go to bed as soon as it begins, and to keep there until the cold is cured. If you cannot follow this plan, then *drink as little of any fluid as you can* for four or five days, and there will soon be not enough blood, as regards quantity, in your body to keep internal parts over-charged, and they will be relieved, and you will get well. There is this evil in the first plan of curing a cold. People who have lain in bed for some time, come out of it with the pores of their skins more than usually opened, and more than usually disposed to suffer from any fresh chill. People who pursue the second plan may be exposed in any way, without meeting this risk.

There are thus then **Golden Rules for the management of the clothing**, as well as for the management of the feeding, which all people should have stamped on their understandings, and engraved upon their memories. These are—

Follow the example which Nature sets, and WEAR THICKER CLOTHING IN COLD WEATHER THAN IN WARM.

DO NOT LAY ASIDE THE WARM CLOTHING OF WINTER, AS SOON AS FINE MILD WEATHER SEEMS TO HAVE BEGUN, but wait until you see that Nature is taking their winter garments away from the birds and the beasts.

NEVER EXPOSE YOURSELF TO A CHILL WITHOUT EXTRA CLOTHING, WHEN YOU ARE WEARY, as well as warm.

NEVER SIT IN DRAUGHTS OF COLD AIR WITHOUT PUTTING ON EXTRA CLOTHING.

KEEP IN BRISK EXERCISE WHEN YOU ARE UNABLE TO AVOID CURRENTS OF CHILL AIR, AND ARE AT THE SAME TIME FATIGUED BY EXERTION, AND THINLY CLAD.

NEVER REMAIN IN DAMP CLOTHES LONGER THAN YOU CAN HELP. Damp clothes chill the surface of the body very rapidly by carrying away its heat as the moisture is turned into steam. Wet stockings and boots, or shoes, are injurious, for the same reason as other kinds of wet clothing. They are not more dangerous than other kinds of damp garments, but they have to be encountered much more frequently on account of the ground often remaining wet for long periods, when there is no great excess of moisture in the air. Wet feet produce harm more frequently than wet clothes, because they are much more common.

By a careful and constant attendance to the principles laid down in these **Golden Rules**, the attacks of many grave diseases may be avoided, and the advantage which is intended to result from the influence of warm clothes, may be most certainly secured.

THE GAIN

OF A

WELL-TRAINED MIND.

THE GAIN OF A WELL-TRAINED MIND.



I WAS sitting quietly reading in my room the other day, when a noisy blue-fly dashed in at the window, standing a little open below, and flew buzzing round and round; now sailing past the tip of my nose with impetuous speed, and now carrying his boisterous investigations to all the corners of the apartment. When he had tired himself, and satisfied his impertinent curiosity, he wished to take himself off as he came, but not being possessed of much practical knowledge of the properties of glass, he here found himself in a considerable difficulty. Seeing nothing before him in that direction, he made a bold dash at the upper part of the window, which had not been opened, and alas! bounced against the glass with a heavy sound, and fell stunned upon the window frame. Having there collected his senses, rubbed his bruised head with his legs, and flapped his wings to see that they were unharmed, he soared up once more, swept round the room, and again came plump against the glass. This proceeding was repeated time after time, until pitying the noisy fellow's evident incapacity to understand a window opened below and not above, I mercifully put an end to his perplexity, and reversed the order of affairs. I drew down the upper sash, and then upon his next round he dashed through the free space and disappeared into the outer air, possibly comforting himself with the reflection that there is nothing like perseverance after all. If I had not come to his aid, though, perseverance would not have

gone far to free him from his trouble. He would have continued all day long knocking his head against that impenetrable, although invisible rock, drawn in that direction by the glare of the light, and would have found himself at night not one step nearer to his object—escape from the trap in which he had entangled himself. When the noisy blue-fly dashed out of the window, after I had opened for him a passage, I said to myself, “You are a stupid, blundering, thick-headed fellow; but after all I do not know that you are worse than some men I have seen in a like predicament. Unwelcome and unpromising as the task would be to teach you to find your own way out of the difficulties you stumble upon, there are really human beings whom it would be just as hard to train for the same end.”

Soon after I had let the buzzing blue-fly out of my room, I sauntered out into the garden. It was a fine summer afternoon, and my attention was caught almost directly by the beauty of a gay butterfly, which was flitting about in the sunshine. I stopped to notice the light-hearted trifle, now hanging with doubled-back wings at the tip of a sweet pea-blossom to rifle it of its honey with uncurled tongue, and now playing lazily in the soft breeze with re-opened pinions. “That painted lounge,” I thought as I watched him, “takes life very easily.—Existence must surely seem to him a strange compound of rare scents, sweet flavours, warm sunshine, and balmy air.”

While I thus contemplated the butterfly-lounge, flitting so jauntily from spot to spot, and thus reflected upon his behaviour, a blue flash suddenly struck through the sunshine with an ominous whir, and two pairs of long transparent pinions, glittering with the colours of the rainbow, bore a dark grim streak across the path of the gay insect. In a moment its painted wings dropped from its shoulders, and its honey-fed body was borne away in the pitiless

grasp of a pair of relentless jaws. A big-headed ogre of a dragon-fly, hunting the breeze with keen scent, had taken a fancy to the person of the butterfly, and had snapped it up, leaving nothing behind but the dry, tasteless pinions, and the useless plumage, which had just before glanced so bravely in the sunshine. The poor butterfly had been a harmless *insect of pleasure*; and he had become the spoil of an *insect of prey*.

There are in the insect tribes head-strong, stupid fellows who cannot be taught; harmless loungers, who consume all their time in mere sensual enjoyment; and rapacious savages, who prey upon their neighbours. In addition to these there are also industrious and busy workers, who employ themselves constantly in steady occupation. Not long after the onslaught made by the dragon-fly in the garden, a very different actor presented himself in the same spot. A round burly personage with short stiff wings lit upon one of the sweet peas which had been the object of the butterfly's attention, and in a brisk bustling way pushed his head and shoulders into the recess of the flower, and then directly turned back with a short hum, which seemed to say, "That won't do. Somebody has been there before me." Next he moved by a sudden jump to a bunch of honey-suckle hanging close by, and examining blossom after blossom, rasped his rough and ridged tongue up and down the mouth of each syrup-bedewed tube, and then brushed the dust which he found on the central threads of the flower into little wicker baskets which he carried upon his legs. So soon as he had rasped as much honey in this way from the flowers as he could stow away in his honey-bag, and had gathered as much powder as his baskets would hold, the busy bee rose high into the air, and struck straight out for his hive. There, a few minutes afterwards, he might have been seen, I have no doubt, emptying his honey-bag into store pots, and adding the sticky powder to moulded

heaps. The bee, instead of wasting his time in profitless sipping and lounging, or exerting his strength in destructive attacks upon creatures that chance to be weaker than himself, applies himself to the formation of a waxen hive, and then collects stores of food, which he packs away in commodious chambers against cold and rainy days. As there are butterflies, and buzzing flies, and dragon flies, and bees, among insects, so also there are among men. Reader of these pages, you yourself are either a blue-fly, or a butterfly, or a dragon-fly, or a bee, and it may not be amiss for your own interests if you try to settle for yourself the very important question, "to which of these tribes do you properly belong?"

This question is very important, because self-knowledge in the matter closely connects itself with certain duties and responsibilities which are laid upon human creatures. In the insect world no choice is left to the individual, as to whether it will be an insect of useful work, an insect of pleasure, or an insect of depredation. Every bee is a bee from the beginning, and continues the same to the end. Every dragon-fly carries its rapacious propensities and habits with it from the cradle to the grave. Men, on the other hand, are born butterflies, and dragon-flies, and bees, all in one, and are allowed free-will to choose which character they will finally bring out and strengthen. It depends, in a great measure, upon themselves, and in some measure upon the influences which are around them, whether they will be mere lazy and useless creatures of selfish pleasure; or busy workers for a good end; or agents of mischief and destruction. Let us see more particularly how this interesting matter stands.

All animated beings come into life with stubborn propensities and headstrong dispositions, just like the blue-fly. They are not, however, left altogether to the influence of these blind inclinations and fancies. They have generally some better guide and adviser near,

whispering to them wise counsel which their mere inclinations cannot furnish. Some dumb animals, indeed, make a very astonishing use of the help which is thus furnished. We all know what horses and dogs are usually taught to do, and have heard very interesting tales of the sagacity of such knowing creatures as monkeys and elephants. One instance, however, may be alluded to with advantage, on account of its affording an amusing as well as instructive illustration. A French naturalist, who was travelling in Africa about three-quarters of a century ago to study the ways of Nature in that wild place, had tamed a large monkey, and made a companion and pet of him. This four-handed favourite answered to the name of Kees, and when he had no other kind of food provided for him, used to cater for himself by digging up a particular kind of root out of the ground. In doing this, his plan was to seize hold of the tuft of the roots with his teeth, and then to scratch the soil all round with his fingers, until the root was loosened enough to allow him to draw it gently out without breaking. When, however, it happened that a root held too fast to permit of this plan being successful, he changed his tactics, and having taken a firm hold of the root with his teeth as low as he could, he all at once threw a summerset, turning himself head over heels, the root of course rarely failing to follow, when the whole force of the monkey's body was thus cleverly put into the work of extraction. Whenever during a journey Kees became tired, he used to mount himself on the back of one of his master's dogs, and make the quadruped carry him for hours. There was one old dog of the pack, however, which was a match even for master Kees. This dog never attempted to avoid the monkey, as his canine brethren always did, or tried to shake him off, or even disputed the point with him, when it pleased him to mount. So soon as he felt Kees on his shoulders, he made a dead halt, and stood as still

as a statue, looking round him with the utmost gravity, while the train of the traveller past onwards in its progress. Kees put on an equal show of obstinacy, and sat still too, until his master was nearly out of sight. Then he jumped down in great alarm, and both the rider and steed started off at full speed after the train, each however keeping a sharp eye upon the other, and the dog taking good care that the monkey was always a trifle in advance.

Kees had the misfortune to be rather weak in the matter of honesty, but he was quite aware of his infirmity, and thoroughly ashamed of himself when he yielded to temptation. His master was sitting at his dinner one day, when he heard the note of a bird, which he desired to possess, close at hand, and seizing his gun, started off in pursuit of the bird. He secured the specimen, but when he returned, both Kees and his dinner were gone. Night came, and the culprit had not returned. A second and a third followed, as well as the intervening days, and a report was then brought in that the thief had been seen hiding himself among branches not far away from the encampment. The rejoiced traveller went immediately to the spot, and there sure enough was his friend Kees standing upon a low branch of a tree, nearly hidden behind a projecting trunk, but with his face gravely and mournfully peeping out of concealment. He had been within sight of the encampment all the time, keeping a watchful eye upon all that was going on; but he had been restrained from returning to his usual place in close attendance upon his master by an uneasy conscience. His master, greatly pleased at the discovery of the missing favourite, now called to him to come down, but he could not be prevailed upon to stir, and only answered by a low supplicating sound whenever he was spoken to. His master then climbed the tree after him, and he made no attempt to escape, but exhibited the strangest admixture of joy and fear by his countenance and chattering when he was seized.

Not long after this the traveller was one day giving his black men a feast. Among other things they had brandy served round to them in a glass, and Kees, who had acquired a rather unfortunate propensity for strong drinks, stood eagerly waiting in the circle for his share, with a flat plate before him. He was not allowed to drink out of a glass, because in his impatience he generally poured some of the spirit into his nose, to his own great annoyance and discomfort. The brandy was put into the plate, and he was just bending down his head to drink, when to his horror the liquid all at once burst into a blue flame. His master chanced to be sealing a letter at the time, and had slipped a strip of lighted paper under his chin into the plate. Kees, with a terrific yell, leaped backwards fifteen feet at a single bound, and then stood in the utmost alarm, trembling, and chattering, and gazing at the blaze. From this time forward, however, Kees was altogether proof against the allurements of strong drink. Nothing could ever again prevail upon him to touch the fiery liquid. The blue flame which had issued from it was a light to his understanding, as well as a blaze to his eyes. The mere sight of a bottle was thenceforth sufficient to send him scampering away into the woods.

Thus then the amusing baboon Kees had very stubborn and headstrong inclinations, which urged him to steal his master's dinner when his back was turned, and which compelled him to be very eager after the sensual enjoyment of drinking brandy. But he had also faculties which enabled him to resist the power of these inclinations, and which even gave him a dawning idea that those inclinations did not guide him in the best possible way. The fact is simply this—all animals come into the world with strong propensities, which drive them to do selfish things, the sole objects of those propensities being to make them look out for themselves, and provide for the daily wants of their bodies. But most animals have

also, when they come into the world, a better monitor coupled with their propensities, which tells them that there are other things, besides selfish gratifications, worth having, and that selfish gratification, if indulged without control, leads afterwards to punishment and suffering. This monitor deals principally with *reasons* why things should or should not be done. It teaches what conducts to good, and what conducts to evil, and also shows why it is right and wise to yield only to such inclinations as do not lead to evil. Hence it has gradually come to be known by the name of REASON. Some of the lower animals have scarcely a trace of this Monitor Reason in their natures. Hence *they* are driven entirely by their uncontrolled animal inclinations and propensities to do what is pleasant to themselves at the instant. Creatures which are thus destitute of even a glimmering of Reason are termed BRUTES,—the word “Brute” meaning simply “senseless” or “unreasoning.” Propensities which are of an entirely selfish and unreasoning kind, are also in the same way very expressively called the BRUTE PROPENSITIES. All the higher animals have strong BRUTE PROPENSITIES in them, but *they* have also more or less clear glimmerings of *Reason*, to soften and bend those headstrong inclinations. The blue-fly, dragon-fly, and butterfly, no doubt are altogether senseless and unreasoning, and perform all their actions under the mere impulse of brute inclination. But the same thing cannot as certainly be said of the bee, which seems to have some very surprising perceptions of purpose in its ingenious work. Kees certainly *reasoned* when he conceived his plan for extracting roots from the ground, and comprehended the fitness of his method for the end he had in view; as he must also have done whenever he scampered into the woods to get out of the way of the black bottle which contained in itself, at once, temptation and fire.

As the higher animals are formed with the elements

of two separate natures in them, so also is that lord of creation, man. Every human being is made of two altogether distinct parts; a low, or *brute half*, common alike to himself and the entire range of inferior animals, and a high or *rational half*, which is especially his own, and is the completely matured form of those qualities which are just weakly shadowed forth in the creatures that approach the most nearly to his privileged position in nature. Take any human individual engaged in some one of the ordinary occupations of civilized society, and follow him through the proceedings of a single day. Observe the butterfly-like eagerness with which he indulges the cravings of his appetites; the buzzing obstinacy with which he clings to habit; the dragon-fly-like fierceness with which he pounces upon any desired object that falls accidentally within his grasp. But mark too, the steady and consistent perseverance with which, day by day, he follows some previously determined aim; how he plans every detail of his work, fits every agent and instrument into its proper place, and takes anxious forethought for the needs of the morrow. There can be no mistake about these signs. Two-sided humanity is there seen with its brute inclinations, and its reasoning powers, acting together, side by side, and each in its particular way.

But there is one notable point in which these two opposite halves of humanity are placed in remarkable contrast. The mere brute propensities of the human being, like those of the lower creature, are in full strength and perfection at the very beginning of life, and are altogether incapable of being altered in any degree by training. The object for which they are brought into existence, is merely the prompting of the individual to be always alive to its material interests and the necessities of its bodily frame; hence they are full-grown the moment the creature, to which they belong, begins its independent career. The human infant, so weak and so powerless in other particulars,

performs all its operations of animal impulse, with unfailing promptness and precision. It is perfectly skilled in the process of drinking, when it takes its first peep into the world. Let some clumsy nurse prick its tender skin as she dresses it, and you will find that it is particularly clever in the art of screaming. Forget the time for supplying it with food, and you will learn that it is as apt as yourself at expressing its want. Now all these senseless impulses, so vigorous in the infant from the very first, continue to be so to the end, and of necessity tyrannize and domineer over the actions of the individual, unless they are brought into subjection by an authority which is stronger than themselves. Servants by design, they run riot in the absence of the master, and set themselves in his place, they making, of course, but a pitiable hand of the performance of duties which are beyond their proper sphere.

The master which is ordained to bring these turbulent servants into subjection, that is "the reason," on the other hand, is in the infant, as yet in a very puny state. The cleverest baby in the world shows very little purpose in its movements before it is a year old. Even at two years old, its understanding makes strangely little show. But at threescore-years and ten, the mind, which will have been brought out from that puny beginning, will be seen, in all probability, still expanding with unchecked power, and embracing the grandest mysteries of the heavens and of the earth. Nay, in extreme old age, it will be possibly contemplated flashing forth with undimmed lustre even over the brink of the grave.

Here, then, is the secret of some men being so base and weak, whilst others of their race reach to high excellence. Human nature has a brute half, which is always active and strong, and a reasoning half, which is never active, until it has been made so by training. The butterflies and dragon-flies of the race, which haunt the earth, and prowl about in society,

are human beings whose reasons have not been awakened into activity, and whose brute inclinations and propensities have consequently been left in undue supremacy. They are helpless creatures, persecuted by the tyranny of uncontrolled and uncontrollable impulses, that strive only for passing gratifications of sense. To rescue itself from this dreadful tyranny, and to secure to itself the full privileges of its humanity, should evidently be the resolute aim of the rational creature. It is to accomplish this noble work that all schemes of education are planned. Education, indeed, is simply a "*drawing out*" and strengthening of the higher faculties of the reasoning being, so that those faculties may be used in guiding and bridling the headstrong irrational propensities. Education raises the unreasoning and as yet brutal creature into the reasoning and intelligent being, and so enables it to work out the great purpose for which it has been placed upon the earth, the continual advance towards higher and nobler states of existence. Education only deserves the name when it performs this office. The operation which is known under the name, often fails lamentably to accomplish the end, even though it is held in high repute, and merely confers a surface readiness, in the place of drawing out internal strength. Persons who have been "*educated*" according to the commonly accepted sense of the word, commonly remain very obstinate, senseless, and even brutal on this account.

On the other hand, persons who are said to have been without the benefits of "*education*," no less frequently do get their reasons drawn out and disciplined in a very effectual and admirable way. It is a curious truth, that nature commonly works out her grandest ends by very inconspicuous and trifling means. The stupendous globe, which forms the dwelling-place of man, although so enormously vast, is itself composed of separate particles, which are individually too minute to be seen. The small rain-drops which fall

so softly through the air, wear away the mountains, fill up the valleys, and change the deep seas into dry land. So often it is the trifling incidents and things scattered around in every-day life, and within the reach of every individual, which furnish the best means for training those highest faculties of the reasoning being; faculties which are, in their full and perfected form, the peculiar privilege of humanity, and which in that form, are known under the name of MIND.

Here then we come to this interesting conclusion, my human friend. You, in common with all your brothers and sisters of humanity, are composed of two entirely distinct parts. You are made up of ANIMAL PROPENSITIES, which are in maturity and strength the moment your life begins; and of MIND, which is powerless and weak at the commencement of life, but which grows progressively stronger, day by day, under training, as life goes on. Your actions, consequently, are directed by either, or by both of these powers, according to the handling you have had. If your mind has been neglected and left in its weak and infantile state; even when you have reached years of maturity, then you remain to the end little else but an over-grown child, and do just what you feel inclined to attempt at the moment, without any regard to the consequences of your acts. But if your mind has been carefully looked after and well trained, then you bring your headstrong and unreasoning inclinations into subjection to your mind, and only allow them to influence and drive you when you are satisfied that your actions will be in accordance with some good object and well-considered aim you have contemplated beforehand. In the one case, you will be a mere blind animal, stumbling along in constant danger of falling into mischief, and working harm, both for others and yourself. In the other case, you will advance steadily through years to one grand prize of your high calling, the acquirement of an intelligent

spirituality that will enable you to rise above the impediments of the flesh.

If then, the training of the mind hold out the promise of such high gain as this; if the drawing out and strengthening of this nobler part of your nature can transform you from a senseless animal, very little raised above the brute, excepting in capability for mischief, into a creature but little lower than the angels; you will admit, that no amount of labour or care which is given to this work of training can be more than you ought to desire from your inmost soul to take. But you will say, how are you to proceed about this business of training? What are you to do to draw out these glorious and mighty powers? How are you to put your headstrong inclinations into chains and leading strings, and how to awaken the sleeping powers of your mind? There is but one complete answer which can be given to this question. The end can only be gained by a life-long experience. The individual who would secure just fair play for his mind, must be ever awake and always on the watch, and must take advantage of every opportunity that comes within his reach. There are places, called schools, in which, arrangements are made upon forethought and upon system, to carry out in a certain measure, the training of the mind. Under the most favourable circumstances, however, these schools do nothing more than make a beginning of the important work; and often it must be confessed, that the beginning is a sadly ineffectual and unsatisfactory one. At any rate, when people leave school, if the discipline there have been of the best possible kind, so far from having finished their education, the real fact is, that they are but just placed in the position in which they may hope to enter upon the task with fair prospects of success. Never forget that education ends, not with leaving school, but with leaving the world; that is, speaking only in the narrow and worldly sense,—for indeed, there is sound christian ground for the

belief and hope, that education is carried on in that Father's house which has many mansions, and in that life of opened-out capacity and enlarged opportunity which lies beyond the grave.

As, then, education is such a lengthened task, and embraces such a wide range of operations, you will not wonder that it is not my purpose to attempt to show what it ought to be in its completeness. He who after many years of unceasing labour has still barely arrived at the sense that his own education has begun, is very far from being in a position to say what a perfected education needs. But this much at least he can do:—he can tell what the plans are which he has found most helpful to himself while striving to secure the gain of a well-trained mind, and which he has seen to produce the most certain advantages in other cases around him. He can venture to lay down a few *Golden Rules* for self-discipline in mental affairs, just as he has in regard to self-discipline in the management of the material blessings God has furnished.

The first thing every reasonable being has to do, as a preliminary step in the training of his mind, is to acquire the habit of noticing all that is going on around him. Nature provides for the accomplishment of this to a very considerable extent by making people prying and curious. Young children begin very soon to observe every thing which is within reach of their senses. But after a time, when a tolerably large stock of ideas and memories has been thus stored up, people settle down satisfied with what they have procured, and become slow and indifferent to further observation, unless they compel themselves, by an intentional effort, to keep wide-awake. Now, through the entire range of a long life there is always an abundance of things to be learned. Every day brings to every man its surprising train of novelties, if that man do but know how to mark and use what each day brings. In order, however, that

he may be always ready and quick to catch the advantage of the passing moment, it is necessary that he should deliberately and resolutely train himself to the habit of observing things very narrowly and carefully, and of preserving on his mind very exact and clear pictures of the objects which he has seen.

In forming the habit of useful observation, nothing is so helpful as to make a systematic occupation of the study of some portion of nature's productions. Men who spend a few years of early life in gathering and examining plants or insects, or in going to museums and collections to consider the appearances presented by animals, shells, minerals, and productions of art, are quite certain to be better and more trustworthy observers in later days, than they ever could be without such early discipline. But persons who are prevented from entering upon these laborious courses, or who are unwilling to do so, may still find a very serviceable set of objects to exercise their faculties upon, in the mere routine incidents of their every-day lives, let those be whatever they may. There are always living creatures about them, which they may make an acquaintance with, and men and women, the most complex and varied of all living creatures, and the most worthy of close study in regard to their bearing towards each other, and to their proceedings at large. Then, too, there are always the magnificent and unbounded skies over their heads and within sight; the movements of the heavenly bodies, the transitions of the weather, the changes of the seasons; the grand march of summer and of winter, of day and of night; the behaviour of the winds and clouds, the rain and the lightning, the sunshine and the storm.

But we will suppose that, from some very unfortunate accidents of your position, your opportunities for noticing even these things are unusually limited, you will say what are you to do then. Why even

this possibility has been beneficently considered and cared for. On account of the bountiful provisions which have been made for His creatures' needs by the Author of Nature, human beings may be shut up in close rooms and yet range free through nature, contemplating all its majestic sights and sounds. Nay, men may even be deprived of their eye-sight, and yet *see* very clearly and correctly *with their minds*. This surprising result is secured through the agency of Books.

By means of artificial symbols and signs planned with much ingenuity, and rendered convenient by much consideration and labour, men who have collected an extensive knowledge of the objects which are spread through the wide fields of nature, are enabled to impress images of those objects upon paper, in a form that can be recognized by other minds, and that can be then multiplied a thousand or even a million-fold, and scattered to all the corners of the earth. When blind persons have to get a knowledge of things from these books, their lines can be read aloud by creatures possessing the faculties of speech and of sight, so that the images are introduced into the minds of the blind, through the ears, instead of through the eyes. But those who enjoy the blessing of clear sight, and who are not at all limited in the range of their personal observation, may, nevertheless, derive inestimable advantages from these written and printed aids. If their range extends through even such a diversified country as England, by the magical help of books that country may be stretched into a world many hundred times as large. It would be altogether impossible to express in language how vast the debt is which mankind owes to Books, when they are merely looked at in the light of being contrivances for recording and scattering notions of actual things.

But when people have gained a large store of valuable knowledge of things, this store will be of

comparatively small value unless it be then applied to its proper use. This use, you will at once understand, is the exercising and disciplining of the various faculties of the reason and mind, so that these may grow stalwart and strong; just as the arm of the blacksmith does when it is engaged all the day long in swinging the heavy hammer upon the anvil. Set a young man to walk about with his arms folded upon each other, and let him go so through life, and you will find at the end that his arms are weak, skinny members, hardly able to lift a hat from the ground. But make a young man a blacksmith at 20 years of age, and before he is 30 he will have arms of hard muscle which will be able to fell an ox, if such stand in his way. Exactly so, the mind which is left folded, although, perhaps, it may be folded around a dry store of facts, will be a weak, puny member to the end, incapable of doing anything, either for itself, or in behalf of its neighbours: while the mind which is set vigorously to work to hammer out, and adjust, and weld, and arrange its store, will soon be a vigorous member, capable of sweeping away difficulties as fast as they appear, and equal to the task of working out the grandest results by its own brave exertion. Now the way in which the mind hammers and welds facts, and grows strong through the exertion, is simply this: it distributes its observations and memories in an orderly and methodical way, and then busies itself continuously with re-considering each separate one, and with picking out such as seem to have fallen into wrong positions, and placing them in situations in which they appear to occupy more suitable relations. The mind, when engaged with its proper work, is constantly sorting, and contemplating, and re-arranging the notions of which it has come to be possessed, and in detecting the fitness or unfitness of these in all the various connections in which they can be viewed. The next thing to do, then, after your mind has been trained to observe and remember

carefully and clearly, is to train it to reflect patiently and maturely. No day of your life should ever pass in which some fair portion of the time is not given to quiet contemplation of the stores of knowledge which have been previously gained.

Here, again, Books are of the highest value. They help people to reason and think even more than they aid them to observe. When a man has spent many laborious days of close thought about some matter which has interested him, and has worked out by this laborious investigation certain distinct views concerning the meaning and bearings of this matter, he can then print in the pages of a book, a simple and clear statement of the conclusion at which he has arrived, without encumbering that statement with the obscurities and difficulties which he has had to flounder through, on his way. The reader who then peruses these pages has the opportunity of arriving at the same conclusion by a very short cut. He gets, by a small expenditure of time, and at a trifling cost of labour, what the writer had earned by a very large expenditure of both; and not only so, for while he is perusing the page, some hundreds or perhaps thousands of men are perusing pages of exactly the same kind, and are so simultaneously gaining precisely the same advantages. By the instrumentality of books, multitudes of men are able to place themselves, at the beginning of their lives, in a position, as regards the training of their minds, which men without such aids, would rarely reach by the ends of their lives. Imagine, for the sake of further illustration, that I spend half my days in studying the influence, for good and for evil, of air and water, of food and clothes, of uncontrolled impulse and regulated minds, and then draw out the principal results of my studies in a clear and distinct form, and print those results down on small pages of paper which can be sent as if upon the wings of the wind, as "Household Tracts," to every home in the land, then you and a hundred

thousand men and women besides, may read those pages, and in half-a-dozen hours see clearly, what, perhaps, I did not manage to see clearly until I had thought about many complicated things for half-a-dozen years. If this be plain to you, then you will perceive that every one who desires the gain, which is the reward of good training to the mind, will LEARN TO READ; that is, not merely to know the meaning of words which are inscribed upon paper, and to follow that meaning as his eye traces the words, but to accompany the author through all the stages of his statements and explanations, until his conclusions are mastered, and taken into the reader's own mental store.

It is a very gainful plan to make it a constant rule to read a little every day, and then to shut close both your book and your eyes, and carefully to recal to mind what you have been reading. You will find that the statements are nearly always made up of matters of fact, and matters of thought:—records of things which have been heard and seen, and records of notions which have been formed in the writer's mind while dwelling upon these heard and seen facts. Try whether you cannot separate these two elements of the reading in your own ideas; then ask yourself how much in either of these elements presents itself to you with the force of novelty. If you find that there is anything either of matter of fact, or of matter of thought, which seems new, and worthy of being retained, then first fix that clearly and distinctly in some fit nook of your memory, and next open your eyes and write it down *as you have fixed it in your memory*, upon some scrap of paper which you can lay aside, in some convenient form of arrangement, so that you may be able to pick the scrap out again for re-perusal if you should ever wish to do so, or for connection with some kindred scrap gleaned from some other field at some future time. If you *read with this spirit* and in this way, you will soon find by

your own experience, how truly wonderful the mind-training power of reading is.

Some books are principally descriptions of facts, others are principally statements of reflection and reason. The former are the most suited to the task of forming and strengthening the powers of observation;—the latter to the work of disciplining and strengthening the judgment and thought. Some men, too, chiefly occupy themselves with noting and recording facts, and with reading the first class of books. Others chiefly busy themselves with thinking and with reading speculative books, and not uncommonly do this while the stores of collected facts upon which they proceed to labour, are pitifully small and insufficient for useful ends. There is a gain to the *race at large* in the subdivision of labour which turns over the scraping together of facts to some men, and the thinking about and investigating of them to other men. Each does *more work in his line* than he could possibly get through if he devoted himself to both pursuits. It is not so, however, as regards the individual. It is always *better for him* that he should exercise his own powers both in observing and thinking; both in reading books of description and of reflection. It is only when he does both for himself that he can secure the full gain of a well-trained mind. It is on account of this that what are called the Physical Sciences possess so remarkable a mind-strengthening power. They all of them consist of a very close and clear statement of facts, and of a no less careful examination of the meaning of those facts and of their mutual relations. "Physical Science" really means only a "*knowledge of Nature.*" An acquaintance with the Physical Sciences comprises simply a knowledge of all the different parts of nature; of the way in which those different parts behave under particular circumstances, and of why they do so. Science teaches the nature and the movements of the heavenly bodies and the earth; of

the water and of the air; of the lightning and of the loadstone; of light and of heat; of dead matter and of living creation. Men clearly cannot follow this teaching without having all their varied faculties of observation and reflection called into the fullest play. I would say to you then, "learn physical science." Study the ways of that magnificent system of Nature, of which you yourself form a part. Learn how the objects which are around you affect your delicately-strung frame for weal and for woe. Learn how you, a puny and weak creature, whose little hand can scarcely reach a yard from your side, may control and rule over those objects, and compel them to do your bidding; and what is yet more, may also control and rule over yourself, and bind your own head-strong propensities in subservience to your mind, even through the strength you will gain in the exertion you will have to make. Learn, too, how you, the weak puny mortal, whose little hand can scarcely reach a yard from your side, and whose frail body must crumble in the dust ere long, can nevertheless rise to the comprehension of a creation which is, in comparison with your puny existence, millions of times more vast than the mighty ocean is in comparison with the rain-drop; and to the recognition of a Creator, who must be as much more vast than creation, as creation itself is more vast than you are. I say, learn these things, not because you will be stored with wonderful learning when you have done so, but because in doing so you will the most surely and fully advance that great work, and prime duty of your life, the drawing out of the highest faculties and capacities of your being, and the conquest of your baser propensities and unreasoning desires.*

* It is the object of the publishers of the Household Tracts gradually to furnish, as opportunity and means serve, exactly that kind of printed help for mind-training work, which will best supply the needs of those who have but small superfluities of money and time.

There is one very puzzling circumstance which you must have frequently noticed in life, just as I myself have again and again. You know that there is a certain strange and troublesome spirit dwelling in some people, which every now and then breaks forth in a very disagreeable way, and torments both themselves and their neighbours, apparently without any purpose or reason. This tiresome and disagreeable spirit is commonly known under the name of TEMPER, or more properly, *bad temper*. The peculiarity, however, which I wish to allude to as being so puzzling, is this, that bad temper most frequently makes its appearance in people, who are in other respects most estimable. They desire to do only that which is right. They sacrifice their own interests for the advantage of their relatives and friends, and they are capable of the noblest actions of generosity and self-denial, being willing to work without ceasing for those who are dependent upon them. Still when the fit of "temper" comes, they are changed in a moment from agreeable and amiable companions, to very disagreeable plagues, and invariably make those individuals the most miserable, whom they most wish to render happy, and whom they love the best.

Now what is this furious and troublesome temper, which thus alike tyrannizes over the person who possesses it, and all who are in any way connected with that person by ties of relationship, or friendship;—this hurricane of the mind which so frequently covers the clear skies of reason and intelligence with shadows and gloom? It is one of the forms in which uncontrolled animal propensity presents itself, when the reason has not been sufficiently awakened and strengthened to be able to keep the baser power under rule. In some people the natural inclination which prompts to the stormy outburst of temper is envy of other people's success; in others it is jealousy; in others it is true destructive rage. But in all the same truth is still contained, that an ungovernable

temper is merely the want of a well-trained mind. Passion and rage are brute qualities and not reasonable ones. Men experience passion and rage, because they are made up of headstrong animal inclinations, as well as of mind. It was intended that human beings should have tempers; if it were not so, they would have been made otherwise by the wise Author of their being. Strong tempers serve to stir them up to activity and energetic effort, and to keep them awake, and this is the reason why it is so often clever and strong-natured people who have strong tempers. It very rarely occurs that fools, however obstinate they may be, have fiery or passionate tempers, because fools are people who have weak natures in every respect, and in whom therefore even the animal inclinations and propensities are feeble, as well as the powers of the mind. But it never was intended that human beings should be driven and ruled by their tempers. The purpose of the Designer of Nature was that the vigor-giving temper should be guided and directed by the superior might of the rational mind. Temper is the spur which keeps the generous steed upon his mettle; but it was never meant that the mettlesome steed should be ridden with the spur, when the bit and the curb had not been placed in its mouth. Remember, then, when you feel cross and out of sorts—and there really is no disgrace in admitting that you do sometimes find yourself in this unpleasant condition, for all human beings have to do so now and then,—that if you give way to the feeling, and permit yourself to be influenced by it in your actions, you are trying to ride a mettlesome horse with a spur, when you have not provided yourself with a bridle and a bit for his mouth. It is all very well for young children to give way to outbursts of passion and temper now and then, because in young children the growing mind is of necessity yet immature, and without its full power. If, however, grown people do the same thing, then they must be looked

upon as being still children in their mature days, and it would be well if they could always be treated in the same way with troublesome children, and be kept in the same kind of safe restraint until they are brought under the governance of reason, and so made to conform themselves to the rule of mind, and to those higher laws which God has beneficently supplied in his written word.

But you will be very anxious to know, if it happens in your own experience that you sometimes find temper a little troublesome and unmanageable, what you ought to do to get it more perfectly in hand. The answer is perfectly clear. If you still must ride along with the spur, strengthen the bit and the curb. If you have a sharp temper, be so much the more sure that you have also a strong mind. The right thing to do, is to give the entire force of your attention to the bringing out of those higher and better powers of your nature, which will rule and bind the rebellious inclinations, when once they are in sufficient maturity and strength. Open out your reason, and as you do so, you will find that passion will draw in its horns. Train your mind, and temper will waste away during the wholesome discipline, until you will cease to have any other evidence of its continued existence than an occasional ruffling, which will disappear of its own accord, almost as soon as it has caused itself to be felt.

People in life commonly make one very grave mistake, which sadly interferes with every fair chance of good discipline for the mind. This mistake is, the belief that *pleasure* and *happiness* are one and the same thing. Hundreds and thousands of men stumble on this rock, and never succeed in making their way beyond it. Yet not only is pleasure a different matter from happiness, but it is in itself an opponent of happiness, when it is allowed to possess an undue influence in the arrangement of affairs. If men who are called "*Men of Pleasure*" could at the end of a

long life marshal together for review the actual gains of their labours, they would stand perfectly aghast to see the miserable train of spectre-like shadows they had to show as the results of their protracted work.

This matter really stands thus. Pleasure consists simply of bodily sensations, which are so agreeable and enticing in themselves, that when people have once experienced them, they desire unconsciously to feel them again. Provided the pleasant feelings are in no way opposed to the higher and better purposes of rational being, and provided they are only indulged in great moderation, it is both lawful and wise that such gratification should be allowed. But unfortunately it turns out that in the common arrangements of society, such pleasures are not necessarily connected with those higher purposes, or in agreement with the decisions of reason. On the contrary, the pleasures that men show themselves most eager for, are the gratifications of headstrong fancies and passions, which lead to harm for themselves, and often cause injury or offence to some other being. There is, too, this unmistakeable character in mere pleasure. Being only a bodily sensation, it, like all other bodily sensations, grows weaker and weaker the longer it is kept up. You know how blind your eye gets if you look long at a bright blaze. This is because the eye gets weary by long seeing, and so ceases to be able to see as well as it could at the first. The structures which feel were only intended to receive impressions from without, and to pass them on inwards to the mind, to be packed away and dealt with in its store-houses. Hence sensation and pleasure, which is but one form of sensation, are short-lived. When not connected with some noble aim, pleasure is but the shortest conceivable span in its duration, and is exhausted as soon as it is felt.

But *happiness* is as enduring as pleasure is transient, and for this reason: happiness is the activity of those very powers and faculties which form the

mind; those very powers which grow by exercise, instead of being worn out by it and exhausted, as bodily sensations are. There can at least be no doubt regarding this fact. Happiness cannot exist apart from worthy exertion of the reason and mind. In order that people may be happy, it is absolutely necessary that they should feel they are occupied in doing something which is good, and that they are daily advancing towards some stronger ability and power in the beneficent work. Happiness is, at least, one very sure gain of a well-trained mind.

Very commonly, industrious people work hard for their wages, and the little bodily comforts which those wages buy. If, however, they do this, with the notion that such wages and such comforts are the sole, or even the principal gain of their labour, they will find themselves, in the end, altogether wrong. The real and only worthy gain of labour, is the training it affords for the better powers of the mind, and the happiness which results as a necessary consequence of the training. Only think what a proof this is of the loving-kindness of the Creator, who has laid the plan of human life. He has ordained that man shall live by the sweat of his brow; but while man wrings the sweat from his brow by toil, he is actually fostering by the act, the growth and advance of his higher mental being. You may say that you know very well that this is the case with people who spend their lives poring over books, but that it cannot be the same with those whose work is performed by the hands rather than by the head. But as an answer I put before you this fact: there is no handicraft, whether followed in the field or in the workshop, that does not need a certain measure of skill and intelligence to be devoted to its performance, and that will not be the better done the more those qualities are drawn upon. Neither is there any occupation which does not require the exertion of patience and perseverance, if it is to be brought to a

successful end. The lowest and meanest work of necessity subjects those who perform it to a by no means narrow course of mind-training, and the extent of this course may be always very easily enlarged at the will of the worker. The determined effort to make work serve this good end, is certain to secure its aim, because the very effort more thoroughly rouses the sleeping powers of the mind. There are nations in the world which live in regions of warm sunshine, where the earth furnishes all that they need of clothing and food without any labour being expended upon it. The people of those nations remain like over-grown children, quite to the ends of their lives. They are never able to undertake and accomplish the glorious tasks which the workmen of colder climates commonly perform. This at once shows the mind-training power even of bodily labour. How great the encouragement is, to all of us, to strive unceasingly to overcome and subdue the headstrong and rebellious inclinations of our natures, and to go on steadily with the work which is presented to our hands, when it is understood that even out of the labour of this struggle is to come the furtherance of our spiritual well-being. While we work to supply the needs of the body, and to win for it wages which, like itself, must perish soon, we are actually providing for the welfare of the spirit, and laying up for it wages which are as enduring and imperishable as itself.

Those, then, who understand the true nature and dignity of work, will not perform it for the mere substantial wages that it brings in the form of money, or money's worth in commodities of various kinds; yet they will feel that when they pursue it with the higher and worthier aim of getting internal strength out of the external exertion, it will never yield the less, even of substantial money, for the plan. The mere strengthening of the powers of the mind, and the application of those powers steadily and smartly

to the labour, will soon make a workman so skilful in his calling, that he will receive better wages for what he does. You know very well that it is always the best workman who gets the best wages, and not only so. It is also the best workman who always secures the most constant work. But he only can become a "best" workman who gives his mind as well as his hands to his calling. I say to you, therefore, for the sake both of the less and the greater gain—the money-wage and the mind-wage—strive to be as skilful and expert, even in your daily calling, as you can.

As, then, the real gain of labour is the discipline it furnishes, and the mind-strength it produces rather than the money which it earns, be careful not to become *unduly* anxious for the increase of worldly possessions and wealth. The desire for riches, and what is called *sufficiency*, often really means the desire for such bodily luxuries and indulgences as are almost sure to turn the worker into a sluggard, and to change buoyant happiness into heavy discontent. The person who makes the acquisition of luxury and indulgence the aim of his labour, really strives to part with that which renders him from day to day more truly and completely a man, that he may take to himself instead occupations which can only minister to the more brutal part of his nature. No one can ever encounter this danger who has once felt that the true object of work is discipline and the fostering of strength. Those who wish for independence and wealth without encountering the temptations and dangers luxury and self-indulgence bring, have indeed a very certain and safe way to secure their desire. They have only to enter upon that noble course of mind-training which enables them to lessen their mere bodily wants. Wealth really is nothing more than an excess of means over needs. Consequently this excess can as well be secured by diminishing the wants, as it can by increasing the means. Do you not constantly see in the world that people who have added largely to their

means are actually poorer than they were before, notwithstanding all the abundance, because they have increased their wants and therefore their expenditure, even more rapidly than their resources. They have learned to think many things necessary, which before they were perfectly content to go without, and have then found themselves perfectly unable to return to their previous simpler mode of life, however much prudence and the cause of true happiness may require them to do so. Seek rather to grow rich by practising that self-denial which keeps your wants within your means, than to do so by heaping up stores of perishable pelf which can only surround you with temptations to lead the life of mischievous and mind-paralyzing self-indulgence; and when your resources do gather, notwithstanding this course, then take care to employ them in increasing your high privileges,—in purchasing good books, and in securing leisure for reading and study, and for the furtherance of the training of your reason and your mind, rather than in quickening your descent to the level of the brutes. Make them sources of good to yourself, and of blessing to others, or they will be snares for your own spiritual existence, and like the breath of a pestilence, will be destructive to all around. Ever try first to form the habit of making a wise use of such means as you may hereafter have to spare, before you allow yourself to strive after the rapid increase of such resources. Then, and then only, can the abundance prove to you real gain and true wealth.

There is one other means of self-discipline, which of necessity stands foremost amidst mind-influences, although thus spoken of last, both on account of the certainty, and of the high character of its power. This is the devout, earnest, and prayerful looking up to the One only Source of excellence, the Divine Author of all that is great and good, who has promised by his Spirit to help man's infirmities, and to guide him to a full perception of the grand and

saving truths which are set forth in the Bible, his written word. The close study of that revelation will teach you that God has sent man into the world to conquer and subdue it by industry and intelligence, and by fighting the good and brave fight against evil, whether that evil be within the intelligent and rational creature, or around. It will teach you too, that that God, as a Father, cares for the progress of his children, while engaged in the discipline of labour and strife, and desires that they should give themselves to the task of seeking wisdom and righteousness, that they may be happy in becoming wise and good. No human creature can dwell upon the thoughts of such great beneficence and love, as he finds set before him both in God's word, and in God's works, without having his heart warmed, and his spirit strengthened to persevere in his labour of self-discipline and of self-improvement, a labour which he knows, through this very testimony, is to be not for to-day, or for to-morrow only, but for all time and for eternity. The mere blind propensities and head-strong inclinations which man shares with the brutes, are born of the dust, and return to the dust. But the intelligence, the reason, the mind, and the soul, which he fosters and strengthens by discipline and labour, are heirs of immortality. For your eternal interests then, as an immortal being, as well as for your present and temporal advantage, as a rational being, secure to yourself the gain of a well-trained mind.



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